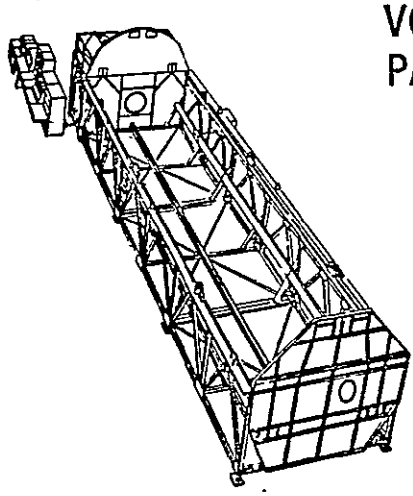
NASA CR-
147667

SD76-SH-0092
VOLUME II
PART 2



# SHUTTLE PAYLOAD INTERFACE VERIFICATION EQUIPMENT STUDY
# VOLUME II TECHNICAL DOCUMENT - PART 2 APPENDICES

APRIL 1976

NASA CONTRACT: NAS9-14000 CCA 140 REV. 1

PREPARED BY:
SHUTTLE PAYLOAD
INTERFACE PROJECTS GROUP

APPROVED BY:
H. E. EMIGH
DIRECTOR
STS/PAYLOAD INTEGRATION

(NASA-CR-147667) SHUTTLE PAYLOAD INTERFACE VERIFICATION EQUIPMENT STUDY. VOLUME 2: TECHNICAL DOCUMENT. PART 2: APPENDICES (Rockwell International Corp., Downey, Calif.) 171 p HC $6.75 CSCL 22B G3/18

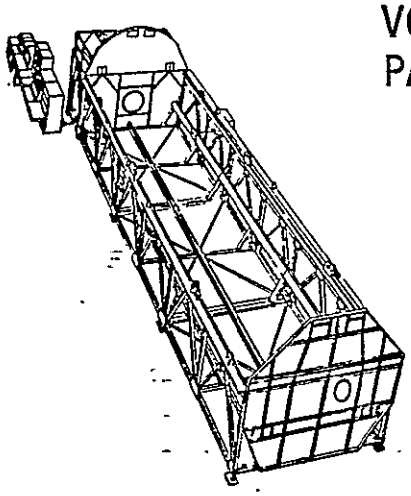
N76-22263

Unclas
25352



Rockwell International
Space Division

SD76-SH-0092
VOLUME II
PART 2



# SHUTTLE PAYLOAD INTERFACE VERIFICATION EQUIPMENT STUDY
# VOLUME II TECHNICAL DOCUMENT - PART 2 APPENDICES

APRIL 1976

NASA CONTRACT: NAS9-14000 CCA 140 REV. 1

PREPARED BY:
SHUTTLE PAYLOAD
INTERFACE PROJECTS GROUP

APPROVED BY:
H. E. EMIGH
DIRECTOR
STS/PAYLOAD INTEGRATION

Rockwell International
Space Division

# FOREWORD

This document is a contractual requirement of NAS9-14000, CCA 140 Revision 1 and is provided in response to the contract. The study was conducted by the Space Division of Rockwell International for the Johnson Space Center of the National Aeronautics and Space Administration. It is published in four volumes:

| | |
|---|---|
| Vol. I | Executive Summary |
| Vol. II | Technical Document - Part 1<br>Technical Appendices - Part 2 |
| Vol. III | Specification Data |
| Vol. IV | Project Plans |

# TECHNICAL REPORT INDEX/ABSTRACT

| ACCESSION NUMBER | | DOCUMENT SECURITY CLASSIFICATION | |
|---|---|---|---|
| | | Unclassified | |

TITLE OF DOCUMENT
Shuttle Payload Interface Verification Equipment(IVE) Study

LIBRARY USE ONLY

AUTHOR(S)

| CODE | ORIGINATING AGENCY AND OTHER SOURCES | DOCUMENT NUMBER |
|---|---|---|
| | Rockwell International Corporation<br>Space Division, Downey Calif. | SD76-SH-0092 |

| PUBLICATION DATE | CONTRACT NUMBER |
|---|---|
| April 1, 1976 | NAS9-14000 CCA 140 Rev. 1 |

DESCRIPTIVE TERMS

| | | |
|---|---|---|
| Shuttle | Preliminary Design | Data Management |
| Payloads | Operators Console | Computer |
| Spacelab | Mission Station | Heat Exchanger |
| P/L Interface | On-Orbit Station | Development Plans |
| P/L Interface Verif. | Payload Station | Schedules |
| Avionics | Electrical Power | |
| Payload Integration | Communications | |


ABSTRACT

Single and mixed payloads must be integrated into the Shuttle Orbiter within the 160 hour turnaround requirement for the Shuttle system. In order to accomplish this integration process some off-line integration capability is required. This report is a preliminary design analysis of a "stand alone" (no facility GSE support required) payload integration device (IVE) capable of verifying payload compatibility in form, fit and function with the Shuttle Orbiter prior to on-line payload/Orbiter operations. The IVE is a high fidelity replica of the Orbiter payload accommodations capable of supporting payload functional checkout and mission simulation. A top level payload integration analysis developed detailed functional flow block diagrams of the payload integration process for the broad spectrum of P/L's and identified degree of Orbiter data required by the payload user and potential applications of the IVE.

This work was performed for Johnson Space Center of the National Aeronautics and Space Administration under contract NAS9-14000 CCA 140 Rev. 1.

TABLE OF CONTENTS

# APPENDIX A

## INTERFACE VERIFICATION EQUIPMENT HARDWARE UTILIZATION LIST (HUL)

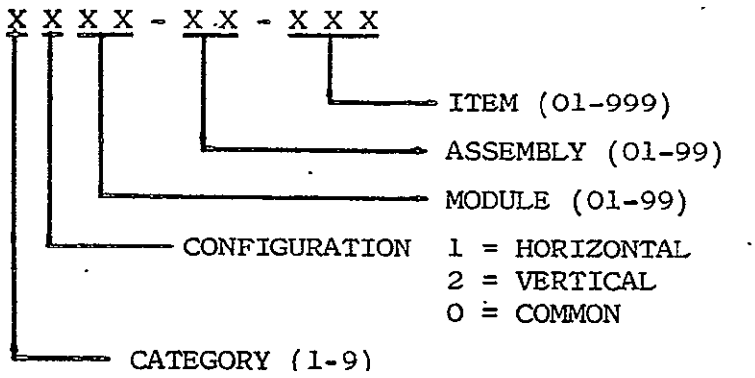
IVE
HARDWARE UTILIZATION LIST
INDEX

| HUL I.D. | ITEM | WBS |
|---|---|---|
| 1001-00-000 | MID-BODY STRUCTURE | 1.2.1.1.1.a |
| 2101-00-000 | MS/PS SUPPORT MODULE | 1.2.1.1.1.b |
| 2102-00-000 | $X_o$576 BULKHEAD | 1.2.1.1.1.b |
| 2103-00-000 | PAYLOAD WIRE TRAY | 1.2.1.1.1.g |
| 2004-00-000 | $X_o$679.5 POWER PANEL | 1.2.1.1.1.f |
| 2005-00-000 | PREFLIGHT UMBILICAL | 1.2.1.1.1.h |
| 2106-00-000 | $X_o$1307 CROSS SUPPORT | 1.2.3.1.1.n |
| 2007-00-000 | $X_o$576 AVIONICS HARNESS SUPPORT | 1.2.1.1.1.b |
| 2108-00-000 | MISSION SPECIALIST SECONDARY STRUCTURE | 1.2.1.2.2.a.1 |
| 2109-00-000 | PAYLOAD SPECIALIST SECONDARY STRUCTURE | 1.2.1.2.2.a.3 |
| 2110-00-000 | ON-ORBIT STATION SECONDARY STRUCTURE | 1.2.1.2.2.a.2 |
| 3001-00-000 | OPERATOR'S CONSOLE | 1.2.1.2.1 |
| 3002-00-000 | DC POWER SET | 1.2.1.2.3 |
| 3004-00-000 | AFT FLIGHT DECK SET | 1.2.1.2.2 |
| 3005-00-000 | DELETED | |
| 3006-00-000 | DELETED | |
| 3007-00-000 | DELETED | |
| 3108-00-000 | CABLE SET | 1.2.1.2.4 |
| 3109-00-000 | DELETED - SEE 3108-00-000 | |
| 3110-00-000 | DELETED - SEE 3108-00-000 | |
| 4101-00-000 | $X_o$576 AIRLOCK INTERFACE | 1.2.3.1.1.g |
| 4102-00-000 | $X_o$660 TUNNEL INTERFACE | 1.2.3.1.1.h |
| 4003-00-000 | P/L PRIMARY LONGERON FITTING, NON-DEPLOYABL | 1.2.1.1.1.c<br>1.2.3.1.1.a |
| 4104-00-000 | AUXILIARY KEEL FITTING | 1.2.1.1.1.e<br>1.2.3.1.1.c |
| 4105-00-000 | P/L UPPER CLEARANCE GAGE | 1.2.3.1.1.i |

IVE
HARDWARE UTILIZATION LIST
INDEX
(CONT)

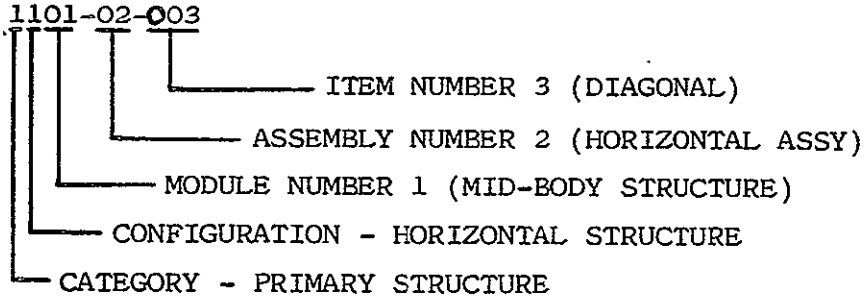
| HUL I.D. | ITEM | WBS |
|---|---|---|
| 4106-00-000 | LOWER CLEARANCE GAGE | 1.2.3.1.1.j |
| 4107-00-000 | OMS DELTA V ENVELOPE | 1.2.3.1.1.k |
| 4108-00-000 | FLOODLIGHT $X_o$576 BULKHEAD | 1.2.3.3.1.a |
| 4009-00-000 | $X_o$576 PAYLOAD SERVICE PANEL | 1.2.1.2.2.a.5<br>1.2.3.3.1.f |
| 4110-00-000 | ENVIRONMENTAL CONTROL UNIT SET | 1.2.3.2.1.a |
| 4111-00-000 | (DELETED) | |
| 4012-00-000 | HOISTING | 1.5.1 |
| 4013-00-000 | (DELETED) | |
| 4014-00-000 | TV, $X_o$576 BULKHEAD | 1.2.3.3.1.c |
| 4115-00-000 | TV $X_o$1307 BULKHEAD | 1.2.3.3.1.c |
| 4116-00-000 | PAYLOAD BAY LINER | 1.2.3.1.1.l |
| 4017-00-000 | PREFLIGHT UMBILICAL ELECTRICAL PANEL | 1.2.3.3.1.d |
| 4018-00-000 | PREFLIGHT UMBILICAL FLUID PANEL | 1.2.3.2.1.d |
| 4019-00-000 | PAYLOAD BAY FLOODLIGHT | 1.2.3.3.1.b |
| 4120-00-000 | $X_o$1307 BULKHEAD | 1.2.1.1.1.b |
| 4121-00-000 | $X_o$1307 P/L OXIDIZER/FUEL PANELS | 1.2.3.2.1.b |
| 4122-00-000 | PAYLOAD MASS SIMULATOR | 1.5.1 |
| 4123-00-000 | (DELETED) | |
| 4124-00-000 | $X_o$1307 ELECTRICAL SERVICE PANEL | 1.2.3.3.1.e |
| 4125-00-000 | (DELETED) | |
| 4126-00-000 | STABILIZING LONGERON FITTING, NON-DEPLOYABLE PAYLOAD | 1.2.1.1.1.d<br>1.2.3.1.1.b |
| 4127-00-000 | CABLE SETS | 1.2.3.3.1.g |
| 4128-00-000 | T-O UMBILICAL PROVISIONS | 1.2.3.1.1.m |
| 4129-00-000 | T-O UMBILICAL FLUID I/F ASSEMBLY | 1.2.3.2.1.c |

IVE
HARDWARE UTILIZATION LIST
IDENTIFICATION CODE




| CATEGORY | CODE |
|---|---|
| PRIMARY STRUCTURE | 1XXX |
| SECONDARY STRUCTURE | 2XXX |
| ELECTRONICS | 3XXX |
| OPTIONAL EQUIPMENT | 4XXX |

SAMPLE:



# IVE HARDWARE UTILIZATION LIST

SOURCE
M = MAKE
B = BUY
O = OFF THE SHELF

CONFIGURATION
H = HORIZONTAL
V = VERTICAL
C = COMMON

TEST REQMTS.
X = TEST REQUIRED
1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | PRIMARY STRUCTURE NOMENCLATURE MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT / ITEM | MATERIAL / SPEC. | DRAWING SEC. 302 PARAGRAPH NUMBER | TEST REQMTS. DEMONSTRATION | QUALIFICATION | ACCEPTANCE | STRUCTURE | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 1.2.1.1.1.a | M | C | 3 | 1001-00-000 | MID-BODY SECTION | | | 118 x 210 x 240 | 14,882 | (3) - 50,648 | | | | | | | | |
| 02 | | M | C | 2 | 1001-01-000 | | VERTICAL PANEL ASSY. | | 12 x 118 x 240 WELDED ASSY. | 6923 | | | | | | | | | |
| 03 | | M | C | 2 | 1001-01-001 | | | LONGERON - BOX | 6 x 10 x 0.50 x 240 TUBE | 947 | CARBON STEEL ASTM-A500 | | | | | | | | |
| 04 | | M | C | 2 | 1001-01-002 | | | STIFFENER-ANGLE | 0.50 x 9½ x 240 ANGLE | 439 | CARBON STEEL ASTM-A36 | | | | | | | | |
| 05 | | M | C | 2 | 1001-01-003 | | | CLEVIS RAIL | 2½ x 3½ x 240 BAR | 318 | 1018 STEEL | | | | | | | | |
| 06 | | M | C | 2 | 1001-01-004 | | | BRIDGE RAIL | 2½ x 3½ x 240 BAR | 291 | 1018 STEEL | | | | | | | | |
| 07 | | M | C | 3 | 1001-01-005 | | | POST-END & CENTER | 6 x 6 x .3125 x 95 TUBE | 213 | CARBON STEEL ASTM-A500B | | | | | | | | |
| 08 | | M | C | 4 | 1001-01-006 | | | DIAGONAL | 4 x 6 x .250 x 103 TUBE | 132 | | | | | | | | | |
| 09 | | M | C | 2 | 1001-01-007 | | | LOWER CORD | 6 x 10 x .375 x 240 TUBE | 736 | CARBON STEEL ASTM-A500B | | | | | | | | |
| 10 | | M | C | 4 | 1001-01-008 | | | GUSSET - END POST | 13 x 21 x .50 PLATE | 38.6 | ASTM-A-572 GRADE 50 | | | | | | | | |
| 11 | | M | C | 2 | 1001-01-009 | | | GUSSET - CENTER (UP) | 9 x 11 x .250 PLATE | 7 | | | | | | | | | |
| 12 | | | | 2 | 1001-01-010 | | | GUSSET - CENTER (LOW) | 9 x 13 x .250 PLATE | 8.2 | | | | | | | | | |
| 13 | | M | C | 4 | 1001-01-011 | | | GUSSET - DIAGONAL | 9 x 11 x .250 PLATE | 7 | | | | | | | | | |
| 14 | | M | C | 2 | 1001-01-012 | | | GUSSET - CORNER | 11 x 13 x .50 PLATE | 20.2 | | | | | | | | | |
| 15 | | M | C | 4 | 1001-01-013 | | | GUSSET - HORIZONTAL | 6 x 6 x .375 PLATE | 3.8 | ASTM-A-572 GRADE 50 | | | | | | | | |
| 16 | | B | C | 35 | 1001-01-014 | | VERTICAL PANEL ASSY. | BOLT & NUT | .75 DIA x 3½ LONG | .75 | | | | | | | | | |
| 17 | | M | C | 3 | 1001-00-001 | | | CROSS BEAM | 10 x 5¾ WF x 188 (I) | 391 | ASTM-A36 | | | | | | | | |
| 18 | | M | C | 2 | 1001-00-002 | | | KEEL BEAM | 10 x 5¾ WF x 115 (I) | 239 | ASTM-A36 | | | | | | | | |
| 19 | | M | C | 2 | 1001-00-003 | | | TIE ROD | 1½ DIA. x 290 | 177 | | | | | | | | | |
| 20 | | M | C | 6 | 1001-00-004 | | | KNEE BRACE | 4 x 6 x .250 x 71 TUBE | 91 | ASTM-A500B | | | | | | | | |
| 21 | | M | C | 6 | 1001-00-005 | | | FOOT-KNEE BRACE | 6 x 13 x .375 PLATE | 4 | ASTM-A-572B | | | | | | | | |
| 22 | | M | C | 3 | 1001-00-006 | | | HEAD-KNEE BRACE | 5 x 7 x .375 x 10 TUBE | 23 | ASTM-A500B | | | | | | | | |
| 23 | | M | C | 2 | 1001-00-007 | | | KEEL LONGERON | 2 x 3 x 2 11/16 x .250 x 240 | SEE 138.6 | ASTM-A 36 | | | | | | | | |
| 24 | | M | C | 6 | 1001-00-008 | | | CLIP - C' BEAM | 7 x 7 x .375 PLATE | 5.2 | | | | | | | | | |
| 25 | 1.2.1.1.1.a | M | C | 4 | 1001-00-009 | | | CLIP - K' BEAM | 3½ x 7 x .375 PLATE | 2.4 | ASTM-A36 | | | | | | | | |
| 26 | 1.2.1.1.1.f | B | H | 4 | 1001-00-010 | | | BOLT - LEVELING | 1 3/4 DIA. x 14 (UNC-2 THD) | 9.5 | ASTM-A325 | | | | | | | | |
| 27 | 1.2.1.1.1.a | B | C | 108 | 1001-00-011 | | | BOLT - C' BEAM | ½ DIA x 1½" LONG | .2 | | | | | | | | | |
| 28 | 1.2.1.1.1.a | B | C | 12 | 1001-00-012 | | | BOLT - KNEE BRACE | ¾ DIA x 7" LONG | 1.2 | | | | | | | | | |
| 29 | 1.2.1.1.1.f | B | C | 4 | 1001-00-013 | MID-BODY SECTION | | NUT - LEVELING | 1 3/4 DIA. (UNC-2 THREAD) | | | | | | | | | | |

ORIGINAL PAGE IS
OF POOR QUALITY

# IVE HARDWARE UTILIZATION LIST

SOURCE
M = MAKE
B = BUY
O = OFF THE SHELF

CONFIGURATION
H = HORIZONTAL
V = VERTICAL
C = COMMON

TEST REQMTS.
X = TEST REQUIRED
1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANTITY | IDENTIFICATION NUMBER | SECONDARY STRUCTURE NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | RECEIVING | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12.1.1.16 | M | H | 1 | 2101-00-000 | MS/RS SUPPORT MODULE | — | — | | 3945 | | | | | | | | | |
| | | M | H | 2 | 2101-01-000 | | SUPPORT ASSEMBLY | — | 78X88X120 WELDED ASSEMBLY | 1739 (6.8%) | | | | | | | | | |
| | | M | H | 4 | 2101-01-001 | | | POST-VERTICAL | 3X3X.188 X120 TUBE | 69 | CARBON STEEL ASTM-A36 | | | | | | | | |
| | | M | H | 4 | 2101-01-002 | | | CROSS TIE-LONGITUDINAL | 3X3X.188 X88 TUBE | 50 | | | | | | | | | |
| | | M | H | 4 | 2101-01-003 | | | CROSS TIE-TRANSVERSE | 3X3X.188 X78 TUBE | 45 | | | | | | | | | |
| | | M | H | 4 | 2101-01-004 | | | DIAGONAL-LONGITUDINAL | 3X3X.188 X122 TUBE | 70 | CARBON STEEL ASTM-A36 | | | | | | | | |
| | | M | H | 4 | 2101-01-005 | | | DIAGONAL-TRANSVERSE | 3X3X.188 X120 TUBE | 69 | CARBON STEEL ASTM-A36 | | | | | | | | |
| | | M | H | 8 | 2101-01-006 | | | PLATE-STAND | 6X6X.58 | 56 | CARBON STEEL ASTM A242(II) | | | | | | | | |
| | | M | H | 8 | 2101-01-007 | | | PLATE-FLOOR | 8X8X.50 | 10. | | | | | | | | | |
| | | M | H | 8 | 2101-01-008 | | | BOLT-ADJUSTING | 1" DIA X 8 TPI X 9" LONG | 2 | | | | | | | | | |
| | | M | H | 8 | 2101-01-009 | | | NUT-LOCK | 1" DIA X 8 TPI | .2 | | | | | | | | | |
| | | M | H | 2 | 2101-01-010 | | | DECK SUPPORT | 3X3X.188 X72 TUBE | 41 | CARBON STEEL ASTM-A36 | | | | | | | | |
| | | M | H | 1 | 2101-01-011 | | SUPPORT ASSEMBLY | DECK PLATE | 78X88X.125 PLATE DIAMOND PATTERN | 293 (6.1%) | HOT ROLLED CARBON STEEL | | | | | | | | |
| | | M | H | 1 | 2101-00-001 | | | DECK PLATE | 28 X 88 X .125 PLATE DIAMOND PATTERN | 105 | HOT ROLLED CARBON STEEL | | | | | | | | |
| | | M | H | 1 | 2101-03-000 | | LADDER ASSEMBLY | — | 19X26X154 WELDED ASSY. | 209 (2.7%) | | DELETED - FACILITY PROVIDED | | | | | | | |
| | | M | H | 2 | 2101-03-001 | | | HANDRAIL | 1½ O.D(NOM) X.145X168 PIPE | 38 (1%) | CARBON STEEL ASTM-A120 | | | | | | | | |
| | | M | H | 2 | 2101-03-002 | | | VERTICAL SUPPORT | 2X1X.188 X120 CHANNEL | 23 | CARBON STEEL AISI-M-1020 | | | | | | | | |
| | DELETED | M | H | 8 | 2101-03-003 | | | CROSS TIE | 1½ O.D.(NOM) X.145X115 PIPE | 4 (.5%) | CARBON STEEL ASTM-A120 | | | | | | | | |
| | — | M | H | 9 | 2101-03-004 | | | STEP | 2X1X.188 X24 CHANNEL | 5 (1.6%) | CARBON STEEL AISI-M-1020 | | | | | | | | |
| | | M | H | 6 | 2101-03-005 | | LADDER ASSEMBLY | BRACKET | 2X2X.125 X12 ANGLE | 16 | CARBON STEEL ASTM-A36 | | | | | | | | |
| | | M | H | 2 | 2101-04-000 | | HANDRAIL ASSY-SIDE | — | 33X76 WELDED ASSY. | 70 | CARBON STEEL | | | | | | | | |
| | | M | H | 4 | 2101-04-001 | | | POST | 1½ O.D (NOM) X .145 X 32 PIPE | 7. | ASTM-A120 CARBON STEEL | | | | | | | | |
| | | M | H | 1 | 2101-04-002 | | | HANDRAIL | 1½ O.D. (NOM) X .145 X 76 PIPE | 17 | ASTM-A120 CARBON STEEL | | | | | | | | |
| | | M | H | 3 | 2101-04-003 | | | CROSS TIE | 1 O.D (NOM.) X .133 X 23 PIPE | 3 (1%) | ASTM-A120 | | | | | | | | |
| | | O | H | 4 | 2101-04-004 | | HANDRAIL ASSY-SIDE | FLOOR FLANGE | 1 X 5 X 6 | 4. | | | | | | | | | |
| | | M | H | 2 | 2101-05-000 | | HANDRAIL ASSY-FRONT | — | | 69 (2.7%) | CARBON STEEL ASTM-A120 CARBON STEEL | | | | | | | | |
| | | M | H | 3 | 2101-05-001 | | | POST | 1½ OD (NOM) X.145 X 32 PIPE | 7. | ASTM-A120 CARBON STEEL | | | | | | | | |
| | | M | H | 1 | 2101-05-002 | | | HANDRAIL | 1½ O.D(NOM) X.145 X 83 PIPE | 18 | ASTM-A120 CARBON STEEL | | | | | | | | |
| | | M | H | 3 | 2101-05-003 | | | CROSS TIE | 1 OD(NOM) X .133 X 27 PIPE | 4 (1%) | ASTM-A120 | | | | | | | | |
| | | O | H | 3 | 2101-05-004 | | HANDRAIL ASSY-FRONT | FLOOR FLANGE | 1 X 5 X 6 | 4 | | | | | | | | | |
| | | O | H | 4 | 2101-00-002 | MS/PS SUPPORT MODULE | | EQL-SIDE OUTLET | 3 X 3 X 3 | 15. | | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

SOURCE
M = MAKE
B = BUY
O = OFF THE SHELF

CONFIGURATION
H = HORIZONTAL
V = VERTICAL
C = COMMON

TEST REQMTS.
X = TEST REQUIRED
1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | SECONDARY STRUCTURE NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | PROOFING | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12.1.1.b | M | H | 1 | 2102-00-000 | X.576 BULKHEAD | | | | 105 | | | | | | | | | |
| | | M | H | 1 | 2102-01-000 | | UPPER BULKHD. ASSY. | | 2X75X195 RIVETED ASSY. | 105 | | | | | | | | | |
| | | M | H | 1 | 2102-01-001 | | | UPPER PANEL | 75X196X.060 SHEET | 60 | AL. SHEET | | | | | | | | |
| | | M | H | 1 | 2102-01-002 | | | LOWER ANGLE | 1½X1½X.125X195 ANGLE | 6 | AL. EXTRUSION | | | | | | | | |
| | | M | H | 1 | 2102-01-003 | | | UPPER ANGLE | 2X2X.125X352 ANGLE | 12.7 | | | | | | | | | |
| | | M | H | 2 | 2102-01-004 | | | VERTICAL STIFFENER | 2X2X.060X55 ANGLE | 1.3 | | | | | | | | | |
| | | M | H | 2 | 2102-01-005 | | | VERTICAL STIFFENER | 2X2X.060X71 ANGLE | 1.7 | | | | | | | | | |
| | | M | H | 4 | 2102-01-006 | | | STIFFENER-ELEC. PANEL | ¾X1¼X.060X19 ANGLE | .2 | | | | | | | | | |
| | | M | H | 2 | 2102-01-007 | | | STIFFENER-SEC. PANEL | 1⅛X2⅞X.060X19 H SECTION | 6 | | | | | | | | | |
| | | M | H | 2 | 2102-01-008 | | | WINDOW STIFFENER | 1½X1½X.060X58 ANGLE | 1.0 | | | | | | | | | |
| | | M | H | 2 | 2102-01-009 | | | HORIZ. STIFFENER | 1½X1½X.060X9 ANGLE | .1 | | | | | | | | | |
| | | M | H | 4 | 2102-01-010 | | | HORIZ STIFFENER | 1½X1½X.060X28 ANGLE | .5 | | | | | | | | | |
| | | M | H | 2 | 2102-01-011 | | | HORIZ. STIFFENER | 1½X1½X.060X60 ANGLE | 1.1 | | | | | | | | | |
| | | M | H | 1 | 2102-01-012 | | | HORIZ. FLOOR SUPPORT | 2X2X.125X52 ANGLE | 2.6 | | | | | | | | | |
| | | M | H | 2 | 2102-01-013 | | | VERTICAL FLOOR SUPPORT | 2X2X.125X42 ANGLE | 2.1 | | | | | | | | | |
| | | M | H | 2 | 2102-01-014 | | | DIAGONAL FLR SUPPORT | 2X2X.125X50 ANGLE | 2.5 | AL EXTRUSION | | | | | | | | |
| | | M | H | 2 | 2102-01-015 | X.576 BULKHEAD | UPPER BULKHEAD ASSY. | ATTACH BRACKET | 5X10X.060 SHEET | .2 | AL. SHEET | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

SOURCE
M = MAKE
B = BUY
O = OFF THE SHELF

CONFIGURATION
H = HORIZONTAL
V = VERTICAL
C = COMMON

TEST REQMTS.
X = TEST REQUIRED
I = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | SECONDARY STRUCTURE NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | PRELAUNCH | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.1.1.1.g | M | H | 2 | 2103-00-000 | PAYLOAD WIRE TRAY | | | | 66 | | | | | | | | | |
| | | M | H | 1 | 2103-01-000 | | TRAY ASSY | | 3½ X 15 X 220 OPEN MAT' SECTION WITH COVER | 66.4 | | | | | | | | | |
| | | M | H | 4 | 2103-01-001 | | | ANGLE - DIVIDER | ¾ X 3 X .060 X 220 ANGLE | 3.0 | AL. SHEET | | | | | | | | |
| | | M | H | 2 | 2103-01-002 | | | COVER - TRAY | 15 X 120 X .050 SHEET | 9 | AL. SHEET | | | | | | | | |
| | | M | H | 1 | 2103-01-003 | | TRAY ASSY | WIRE TRAY CHANNEL | 22 X 240 X .060 SHEET | 32 | AL SHEET | | | | | | | | |
| | | M | H | 6 | 2103-01-004 | PAYLOAD WIRE TRAY | | BRACKET ATTACH | 1½ X 2 X .188 X 3 ANGLE | 2 | AL EXTR. | | | | | | | | |
| | 1.2.1.1.1f | M | C | 1 | 2004-00-000 | X0 6795 POWER PANEL | | | | 4.4 | | | | | | | | | |
| | | M | C | 1 | 2004-01-000 | | POWER PANEL ASSY | | 5 X 13 X 13 BOLT ON ASSY | 1.6 | | | | | | | | | |
| | | M | C | 2 | 2004-01-001 | | | BRACKET | 5 X 11 X .060 SHEET | .3 | AL. SHEET | | | | | | | | |
| | | M | C | 1 | 2004-01-002 | | POWER PANEL ASSY | PANEL | 13 X 13 X .060 SHEET | 1.0 | AL SHEET | | | | | | | | |
| | | B | C | 2 | 2004-01-003 | X0 6795 POWER PANEL | | CONNECTOR - FEMALE | SHELL # 36 - FOUR '0' GAGE WIRE | .6 | | | | | | | | | |
| | | | | | | | | | | .700 | | | | | | | | | |
| | 1.2.1.1.1.h | M | C | 1 | 2005-00-000 | PREFLIGHT UMBILICAL | | | | 6.6 | | | | | | | | | |
| | | M | C | 1 | 2005-01-000 | | UMBILICAL PANEL ASSY | | | | | | | | | | | | |
| | | M | C | 1 | 2005-01-001 | | | PANEL - OUTBOARD | 22 X 25 X .060 SHEET - 7 (11/15) | 1.3 | AL. SHEET | | | | | | | | |
| | | M | C | 1 | 2005-01-002 | | | BRACKET - FWD | 11 X 24 X .060 SHEET | 1.6 | AL SHEET | | | | | | | | |
| | | M | C | 1 | 2005-01-003 | PREFLIGHT UMBILICAL | UMBILICAL PANEL ASSY | BRACKET - AFT | 23 X 17 X .060 SHEET | 3.7 | AL. SHEET | | | | | | | | |

# IVE HARDWARE TILIZATION LIST

SOURCE: M = MAKE, B = BUY, O = OFF THE SHELF
CONFIGURATION: H = HORIZONTAL, V = VERTICAL, C = COMMON
TEST REQMTS.: X = TEST REQUIRED, I = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | SECONDARY STRUCTURE NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL / SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | RECEIVING | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.3.1.1.1.H | M | H | 1 | 2106-00-000 | X.1307 CROSS SUPPORT | | | | 3/7 | | | | | | | | | |
| | | M | H | 1 | 2106-00-001 | | | CROSS TIE | 3X3X.250X190 TUBE | 139 | CARBON STEEL ASTM-A500 | | | | | | | | |
| | | M | H | 2 | 2106-00-002 | | | ATTACH. PLATE | 5X7X.50 PLATE | 5 | CARBON STEEL ASTM-A242(1) | | | | | | | | |
| | | M | H | 2 | 2106-00-003 | | | DIAGONAL | 2½X2½X.250X110 TUBE | .70 | CARBON STEEL ASTM-A500 | | | | | | | | |
| | | M | H | 2 | 2106-00-004 | | | ATTACH ANGLE | 5X5X.50X6 ANGLE | 8 | CARBON STEEL ASTM-A36 | | | | | | | | |
| | | M | H | 1 | 2106-00-005 | X.1307 CROSS SUPPORT | | GUSSET | 8X15X.375 PLATE | 12 | CARBON STEEL ASTM-A242(1) | | | | | | | | |
| | 1.2.2.2.1.6 | M | C | 1 | 2007-00-000 | X.576 AVIONICS HARNESS SUPT. | | | | 19.5 | | | | | | | | | |
| | | M | C | 1 | 2007-01-000 | | VERTICAL SUPPORT ASSY. | | | 10.5 | | | | | | | | | |
| | | M | C | 1 | 2007-01-001 | | | SUPPORT - FWD. FACE | 15½X59X.040 SHEET | 4 | AL. SHEET | | | | | | | | |
| | | M | C | 1 | 2007-01-002 | | | CENTER DIVIDER | ½X1¾X.032X59 CHANNEL | .5 | AL. SHEET | | | | | | | | |
| | | M | C | 2 | 2007-01-003 | | | EMI DIVIDER | ½X1½X.025X59 ANGLE | .3 | AL. SHEET | | | | | | | | |
| | | M | C | 2 | 2007-01-004 | | | BRACKET - VERTICAL | ½X1⅜X2X.050X1 HAT | .1 | AL. SHEET | | | | | | | | |
| | | M | C | 12 | 2007-01-005 | | | BRACKET - HOAIR. | ½X1⅜X2X.050X1 HAT | .1 | AL. SHEET | | | | | | | | |
| | | M | C | 1 | 2007-01-006 | | VERTICAL SUPPORT ASSY. | COVER | 19X59X.032 SHEET | 4 | AL. SHEET | | | | | | | | |
| | | M | C | 1 | 2007-02-000 | | TRANSITION HARNESS SUPT. ASSY. | | DESIGN IS TBD ~ 28" | 9 | | | | | | | | | |
| | | M | C | 1 | 2007-02-001 | | | SUPPORT | 15½X28X.040 SHEET | 1.0 | AL SHEET | | | | | | | | |
| | | M | C | 1 | 2007-02-002 | | | CENTER DIVIDER | ½X1¾X.032X28 CHANNEL | 2.9 | AL SHEET | | | | | | | | |
| | | M | C | 2 | 2007-02-003 | | | EMI DIVIDER | ½X2½X.025X28 ANGE | .5 | | | | | | | | | |
| | | M | C | 2 | 2007-02-004 | | | BRACKET | | .2 | | | | | | | | | |
| | | M | C | 2 | 2007-02-005 | | | BRACKET | | .5 | | | | | | | | | |
| | | M | C | 1 | 2007-02-006 | X.576 AVIONICS HARNESS SUPT. | TRANSITION HARNESS SUPT. ASSY. | COVER | 19X28X.032 SHEET | 2 | AL. SHEET | | | | | | | | |

A-5

SD76-SH-0092

# IVE HARDWARE UTILIZATION LIST

SOURCE: M = MAKE, B = BUY, O = OFF THE SHELF
CONFIGURATION: H = HORIZONTAL, V = VERTICAL, C = COMMON
TEST REQMTS.: X = TEST REQUIRED, I = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | NOMENCLATURE: MODULE | NOMENCLATURE: ASSEMBLY | NOMENCLATURE: ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | TEST REQMTS.: QUALIFICATION | TEST REQMTS.: ACCEPTANCE | TEST REQMTS.: RETEST | TEST REQMTS.: SYSTEM | TEST REQMTS.: SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12122a1 | M | H | 1 | 2108-00-000 | MISSION SPECIALIST SECONDARY STRUCTURE | | | CONCEPTUAL DESIGN ONLY | 67 | | | | | | | | |
| | | M | H | 1 | 2108-01-000 | | UPPER SUPPORT STRUCTURE | | | 5.5 | | | | | | | | |
| | | M | H | 1 | 2108-01-001 | | | CHANNEL SUPPORT | 1x1x3x.080x60 CHANNEL | 3.6 | AL SHEET | | | | | | | |
| | | M | H | 1 | 2108-01-002 | | | BRACKET SUPPORT | 4x4x.070x3 ANGLE | .3 | AL. EXTRUSION | | | | | | | |
| | | M | H | 3 | 2108-01-003 | | | ATTACH FITTING | 1½x3x.090x1½ TEE | .1 | AL EXTRUSION | | | | | | | |
| | | M | H | | 2108-01-004 | | UPPER SUPPORT STRUCTURE | MISC. | | 1.5 | | | | | | | | |
| | | M | H | 1 | 2108-02-000 | | CENTER SUPPORT STRUCTURE | | | 18. | | | | | | | | |
| | | M | H | 1 | 2108-02-001 | | | CHANNEL SUPPORT | 1x1x4x.080x60 CHANNEL | 3.8 | AL SHEET | | | | | | | |
| | | M | H | 6 | 2108-02-002 | | | SECONDARY STRUCTURE | 6x14x4x.090 BEAM | 1.8 | AL BAR | | | | | | | |
| | | M | H | 1 | 2108-02-003 | | | BRACKET SUPPORT | 3x4x.070x3 ANGLE | .1 | AL EXTRUSION | | | | | | | |
| | | M | H | 2 | 2108-02-004 | | CENTER SUPPORT STRUCT. | MISC. | | 1.6 | | | | | | | | |
| | | M | H | 3 | 2108-03-000 | | UPPER CABINET ASSY | | 14x22x19 RIVETED ASSY. | 83 | | | | | | | | |
| | | M | H | 2 | 2108-03-001 | | | END PANEL | 14x22x.050 SHEET .057 | 1.5 | AL SHEET | | | | | | | |
| | | M | H | 1 | 2108-03-002 | | | FRONT PANEL | 19x19x.050 SHEET | 18 | AL. SHEET | | | | | | | |
| | | M | H | 1 | 2108-03-003 | | | TOP PANEL | 15x19x.050 SHEET | 1.5 | AL. SHEET | | | | | | | |
| | | M | H | 4 | 2108-03-004 | | | ATTACH ANGLE LONG | 1x1x.060x19 ANGLE | .2 | AL EXTRUSION | | | | | | | |
| | | M | H | 2 | 2108-03-005 | | | ATTACH ANGLE HORZ | 1x1x.060x14 ANGLE | .2 | | | | | | | | |
| | | M | H | 2 | 2108-03-006 | | | ATTACH ANGLE VERT | 1x1x.060x19 ANGLE | .2 | | | | | | | | |
| | | M | H | 4 | 2108-03-007 | | UPPER CABINET ASSY. | ATTACH FITTING | 1½x3x.090x1½ TEE | .1 | AL EXTRUSION | | | | | | | |
| | | M | H | 3 | 2108-04-000 | | LOWER CABINET ASSY | | 12x14x19 RIVETED ASSY | 6.3 | | | | | | | | |
| | | M | H | 1 | 2108-04-001 | | | FRONT PANEL | 14x19x.050 SHEET | 1.3 | AL SHEET | | | | | | | |
| | | M | H | 2 | 2108-04-002 | | | END PANEL | 12x14x.050 SHEET | .8 | AL SHEET | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

**SOURCE**
M = MAKE
B = BUY
O = OFF THE SHELF

**CONFIGURATION**
H = HORIZONTAL
V = VERTICAL
C = COMMON

**TEST REQMTS.**
X = TEST REQUIRED
1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | SECONDARY STRUCTURE NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | RETESTING | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M | H | 1 | 2108-04-003 | | | TOP PANEL | 12 X 19 X .050 SHEET | 1.2 | AL SHEET | | | | | | | | |
| | | M | H | 4 | 2108-04-004 | | | ATTACH ANGLE (Long) | 1 X 1 X .060 X 19 ANGLE | .2 | AL. EXTRUSION | | | | | | | | |
| | | M | H | 2 | 2108-04-005 | | | ATTACH ANGLE (Horiz) | 1 X 1 X .060 X 14 ANGLE | .2 | AL. EXTRUSION | | | | | | | | |
| | | M | H | 2 | 2108-04-006 | | | ATTACH ANGLE (Vert) | 1 X 1 X .060 X 12 ANGLE | .1 | AL. EXTRUSION | | | | | | | | |
| | | M | H | 4 | 2108-04-007 | | LOWER CABINET ASSY | ATTACH FITTING | 1½ X 3 X .090 X 1½ TEE | .1 | AL. EXTRUSION | | | | | | | | |
| | | M | H | 2 | 2108-00-001 | | | FLOOR ATTACH FTG (INBD) | 2 X 3 X .090 X 1½ TEE | .1 | AL. EXTRUSION | | | | | | | | |
| | | M | H | 2 | 2108-00-002 | MISSION SPECIALIST SECONDARY STRUCTURE | | FLOOR ATTACH. FTG (OUTB) | 2 X 3 X .125 X 1½ TEE | .1 | AL. EXTRUSION | | | | | | | | |
| | 12.12.2.a.3 | M | H | 1 | 2109-00-000 | PAYLOAD SPECIALIST SECONDARY STRUCTURE | SAME AS 2103-00-000 | MISSION SPECIALIST CONSOLE | | 67 | | | | | | | | | |
| | 12.12.2.a.2 | M | H | 1 | 2110-00-000 | ON-ORBIT STATION SECONDARY STRUCTURE | | | CONCEPTUAL DESIGN ONLY. | 424 | | | | | | | | | |
| | | M | H | 1 | 2110-01-000 | | CABINET ASSY. | | 18 X 56 X 60 REMATED ASSY. | 40 | | | | | | | | | |
| | | M | H | 1 | 2110-01-001 | | | FRONT PANEL | 60 X 65 X .050 SHEET | 197 | AL SHEET | | | | | | | | |
| | | M | H | 2 | 2110-01-002 | | | SIDE PANEL | 18 X 56 X .050 SHEET | 5. | AL. SHEET | | | | | | | | |
| | | M | H | 4 | 2110-01-003 | | | FRONT SUPPORT ANGLE | 1 X 1 X .050 X 65" ANGLE | .7 | AL. EXTRUSION | | | | | | | | |
| | | M | H | 4 | 2110-01-004 | | | HORIZONTAL SUPPORT-FRONT | 1 X 1 X .050 X 60 ANGLE | .6 | " | | | | | | | | |
| | | M | H | 4 | 2110-01-005 | | | VERTICAL SUPPORT-AFT | 1 X 1 X .050 X 56 ANGLE | .6 | " | | | | | | | | |
| | | M | H | 4 | 2110-01-006 | | CABINET ASSY | HORIZONTAL SUPPORT-END | 1 X 1 X .050 X 18 ANGLE | .2 | AL. EXTRUSION | | | | | | | | |
| | | M | H | 6 | 2110-00-001 | ON-ORBIT STATION SECONDARY STRUCTURE | | FLOOR ATTACH | 1½ X 2 X .060 X 2 TEE | .4 ea | AL. EXTRUSION | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

SOURCE: M = MAKE, B = BUY, O = OFF THE SHELF
CONFIGURATION: H = HORIZONTAL, V = VERTICAL, C = COMMON
TEST REQMTS.: X = TEST REQUIRED, / = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | ELECTRONICS NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | RECEIVING | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.1.2.1 | | | | 3001-00-000 | OPERATORS CONSOLE | | | | 1800 | | | | | X | | | | |
| | | | C | 1 | 3001-01-000 | | INPUT/OUTPUT CONTROL UNIT | | | | | | | | | | | X | |
| | | B | C | 1 | 3001-01-001 | | | TAPE READER | | | | | | | | X | | | |
| | | B | C | 1 | 3001-01-002 | | | DISK DRIVE | | | | | | | | | | | |
| | | B | C | 1 | 3001-01-003 | | | MAGNETIC TAPE UNIT | | | | | | | | X | | | |
| | | M | C | 1 | 3001-01-004 | | | CRT/KEYBOARD | | | | | | | | | X | | |
| | | M | C | 1 | 3001-01-005 | | | CONTROL PANEL - TEST SYSTEM | | | | | | | | | X | | |
| | | B | C | 1 | 3001-01-006 | | | CONTROLLER/DATA PROCESSOR UNIT (C/DPU) | 128 K PRIMARY | | | | | | | X | | | |
| | | B | C | 1 | 3001-01-007 | | | C/DPU - I/O UNIT | CONSISTS OF TTY, CRT/KEYBD, LINE PRINTER, I/O ELECTRONICS & AUXILIARY MEMORY | | | | | | | | | | |
| | | B | C | 1 | 3001-01-008 | | | ELECTRONICS RACK | | | | | | | | X | | | |
| | | B | C | 1 | 3001-01-009 | | | CARD READER | | | | | | | | X | | | |
| | | B | C | 1 | 3001-01-010 | | INPUT/OUTPUT CONTROL UNIT | THERMAL CONTROL UNIT | | | | | | | | X | | | |
| | | | C | 1 | 3001-02-000 | | TEST MEASUREMENT UNIT | | | | | | | | | | | X | |
| | | B | C | 1 | 3001-02-001 | | | TIME CODE GENERATOR | | | | | | | | X | | | |
| | | O | C | 1 | 3001-02-002 | | | INPUT PATCH PANEL | | | | | | | | X | | | |
| | | O | C | 1 | 3001-02-003 | | | THERMAL CONTROL UNIT | | | | | | | | X | | | |
| | | O | C | 1 | 3001-02-004 | | | WAVEFORM ANALYZER | | | | | | | | X | | | |
| | | O | C | 1 | 3001-02-005 | | | DIGITAL VOLTMETER | | | | | | | | X | | | |
| | | B | C | 1 | 3001-02-006 | | | FREQUENCY COUNTER | | | | | | | | X | | | |
| | | B | C | 1 | 3001-02-007 | OPERATORS CONSOLE | TEST MEASUREMENT UNIT | ELECTRONICS RACK | | | | | | | | X | | | |
| | | | | | | | | | | | | | | | X | X | | | |

# IVE. HARDWARE UTILIZATION LIST

SOURCE
M = MAKE
B = BUY
O = OFF THE SHELF

CONFIGURATION
H = HORIZONTAL
V = VERTICAL
C = COMMON

TEST REQMTS.
X = TEST REQUIRED
1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | ELECTRONICS NOMENCLATURE: MODULE | ELECTRONICS NOMENCLATURE: ASSEMBLY | ELECTRONICS NOMENCLATURE: ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | TEST REQMTS.: QUALIFICATION | TEST REQMTS.: ACCEPTANCE | TEST REQMTS.: RECEIVING | TEST REQMTS.: SUB-SYSTEM | TEST REQMTS.: SYSTEM | TEST REQMTS.: SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | OPERATORS CONSOLE (CONT'D) | | | | | | | | | | | | | |
| | 1.2.1.2.4 | M | C | 1 | 3001-03-000 | | AVIONICS I/F ELEMENT | | | | | | | | X | | | X | |
| | | O | C | 1 | 3001-03-001 | | | IVE LOGIC DC POWER SUPPLY | ± 28 VDC / 100 AMPS | | | | | | | X | | | |
| | | M | C | 1 | 3001-03-002 | | | C&W - DISP. & CONT. PNL. | | | | | | | | | X | | |
| | | M | C | 1 | 3001-03-003 | | | AUDIO UNIT | | | | | | | | | | | |
| | | M | C | 1 | 3001-03-004 | | | CCTV UNIT | | | | | | | | | | | |
| | | M | C | 1 | 3001-03-005 | | | CONTROL & DISP. PNL (P/L) | | | | | | | | | | | |
| | | M | C | 1 | 3001-03-006 | | | AVIONICS I/F SIM. UNIT | | | | | X | | | | X | | |
| | | B | C | 1 | 3001-03-007 | | | ELECTRONIC RACK WIRING SET | | | | | | | | X | | | |
| | | B | C | 1 | 3001-03-008 | | | | | | | | | | | | | | |
| | | B | C | 1 | 3001-03-009 | OPERATORS CONSOLE | AVIONICS I/F ELEMENT | THERMAL CONTROL UNIT | | | | | | | | X | | | |
| | 1.2.1.2.3 | | C | 1 | 3002-00-000 | DC POWER SET | | | | 600 | | | | | | X | | X | |
| | | B | C | 1 | 3002-00-001 | | DC POWER SUPPLY | | ± 28 VDC @ 400 AMPS | | | | | | | X | | | |
| | | M | C | 1 | 3002-00-002 | DC POWER SET | REMOTE CONTROL PANEL | | (EQUIPMENT IN GFE CONSOLE) | | | | | | | X | | | |
| | | | | | | | | | | | | | | | | | X | X | X |
| | | | | | | | | | | | | | | | | | X | X | |
| | | | | | | | | | | | | | | | | | X | X | |
| | | | | 1 | | | | | | | | | | | | X | X | X | |

# IVE HARDWARE UTILIZATION LIST

SOURCE: M = MAKE, B = BUY, O = OFF THE SHELF
CONFIGURATION: H = HORIZONTAL, V = VERTICAL, C = COMMON
TEST REQMTS.: X = TEST REQUIRED, 1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | NOMENCLATURE: ELECTRONICS — MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | REQUIREMENTS SPECIFICATION NO. | TEST REQMTS: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | PRELAUNCH | STS-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.1.2.2 | M | C | 1 | 3004-00-000 | AFT FLIGHT DECK SET | | | | | | | | | X | X | X | X | |
| | " | M | C | 1 | 3004-01-000 | | PAYLOAD STATION | | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-01-001 | | | ENCLOSURE | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-01-002 | | | THERMAL CONTROL ASSEMBLY | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-01-003 | | | AUDIO ASSEMBLY | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-01-004 | | PAYLOAD STATION | PATCH PANEL WIRING | | | | | | | | | X | X | |
| | | M | C | 1 | 3004-02-000 | | ON-ORBIT STATION | | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-02-001 | | | FLOODLIGHT CONTROL PANEL | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-02-002 | | | CCTV CONTROL PANEL | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-02-003 | | | CCTV MONITOR | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-02-004 | | | MISSION TIMER | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-02-005 | | | PATCH PANEL | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-02-006 | | ON-ORBIT STATION | WIRING | | | | | | | | | X | X | |
| | | M | C | 1 | 3004-03-000 | | MISSION STATION | | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-03-001 | | | C&W AND SAFING PANEL | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-03-002 | | | P/L POWER CONTROL PANEL | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-03-003 | | | CRT/KEYBOARD & DEU ASSEMBLY | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-03-004 | | | COMMUNICATION CONTROL PANEL | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-03-005 | | | ORBITER C&W PANEL | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-03-006 | | | AUDIO | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-03-007 | | | FLOODLIGHT CONTROL PANEL | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-03-008 | | | PATCH PANEL | | | | | | | X | | X | X | |
| | | M | C | 1 | 3004-03-009 | | MISSION STATION | WIRING | | | | | | | X | | X | X | |
| | | M | C | 2 | 3004-04-000 | AFT FLIGHT DECK SET | 9C INVERTER | | 115/208 VOLT AC, 3 PHASE 400 HZ, 1 KW. | | | | | | | | | | |
| | 1.2.1.2.1 | | C | 1 | 3007-00-000 | EXTERNAL COMMUNICATION SYSTEM | | | | | | | | | | | | | |
| | | B | C | 1 | 3007-00-001 | | | MICROPHONE | UNI-DIRECTIONAL DESK MOUNT | | | | | | | | | | |
| | DELETED | B | C | 1 | 3007-00-002 | | | LOUD SPEAKER | DELETED | | | | | | | | | | |
| | | B | C | 1 | 3007-00-003 | | | AMPLIFIER | | | | | | | | | | | |
| | | M | C | 1 | 3007-00-004 | EXTERNAL COMM. SYSTEM | | CABLE SET | | | | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

**SOURCE**
M : MAKE
B : BUY
O : OFF THE SHELF

**CONFIGURATION**
H : HORIZONTAL
V : VERTICAL
C : COMMON

**TEST REQMTS.**
X : TEST REQUIRED
1 : QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | ELECTRONICS NOMENCLATURE: MODULE | ELECTRONICS NOMENCLATURE: ASSEMBLY | ELECTRONICS NOMENCLATURE: ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | RELEVINE | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.1.2.4 | M | H | 1 | 3108-00-000 | CABLE SET | | | | | | | | | | | | | |
| | | M | H | 1 | 3108-01-000 | | AFT FLIGHT DECK TO OPERATORS CONSOLE CABLE ASSEMBLY | | | | | | | | | | | | |
| | | M | H | 1 | 3108-02-000 | | E-GROUND ASSEMBLY (SUBSYSTEM TO SINGLE POINT GROUND.) | | | | | | | | | | | | |
| | | M | H | 1 | 3108-03-000 | | OPERATORS CONSOLE TO D.C. POWER SET CABLE ASSEMBLY | | | | | | | | | | | | |
| | | M | H | 1 | 3108-04-000 | | OPERATORS CONSOLE TO PAYLOAD COOLANT UNIT CABLE ASSY. | | | | | | | | | | | | |
| | | M | H | 1 | 3108-05-000 | | FACILITY POWER TO SUB-SYSTEMS | | | | | | | | | | | | |
| | | M | H | 1 | 3108-06-000 | CABLE SET | SELF CHECK CABLE ASSEMBLY. | | | | | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

**SOURCE**
M = MAKE
B = BUY
O = OFF THE SHELF

**CONFIGURATION**
H = HORIZONTAL
V = VERTICAL
C = COMMON

**TEST REQMTS**
X = TEST REQUIRED
1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IVE IDENTIFICATION NUMBER | OPTIONAL EQUIPMENT NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | RECEIVING | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.3.1.1.9 | M | H | 1 | 4101-00-000 | X0.576 AIRLOCK INTERFACE | | | | 108 | | | | | | | | | |
| | | M | H | 1 | 4101-00-001 | | | RING-AIRLOCK/TUNNEL INTERFACE | 30"DIA X 2 X .625 | 68 | | | | | | | | | |
| | | M | H | 2 | 4101-00-002 | | | ATTACH BRACKET | 2 X 6 X .200 X 18 CHANNEL | 9 | CARBON STEEL ASTM-A-36 | C6 X 8.2 CHANNEL | | | | | | | |
| | | M | H | 2 | 4101-00-003 | | | ATTACH BRACKET | 2 X 6 X .200 X 16 CHANNEL | 9 | CARBON STEEL ASTM-A-36 | C6 X 8.2 CHANNEL | | | | | | | |
| | | B | H | 8 | 4101-00-004 | | | BOLT | 1/2 DIA X 13 TPI X 1¼ LONG | .2 | | | | | | | | | |
| | | B | H | 12 | 4101-00-005 | X.576 AIRLOCK INTERFACE | | BOLT | 1/2 DIA X 1¼ LONG - FLAT HEAD | .2 | | | | | | | | | |
| | 1.2.3.1.1.8 | M | H | 1 | 4102-00-000 | X0.660 TUNNEL INTERFACE | | | | 183 | | | | | | | | | |
| | | M | H | 1 | 4102-01-001 | | | RING - TUNNEL INTERFACE | 47"DIA X 3.5 X .625 PLATE | 30 | AL. PLATE | | | | | | | | |
| | | M | H | 1 | 4102-01-002 | | | SUPPORT - LEFT | 1½ X 4 X .247 X 98 CHANNEL | 51 | CARBON STEEL ASTM-A-36 | C4 X 6.25 CHANNEL | | | | | | | |
| | | M | H | 1 | 4102-01-003 | | | SUPPORT - RIGHT | 1½ X 4 X .247 X 98 CHANNEL | 51 | | | | | | | | | |
| | | M | H | 1 | 4102-01-004 | | | SUPPORT - FWD | 1½ X 4 X .247 X 28 CHANNEL | 15 | | | | | | | | | |
| | | M | H | 1 | 4102-01-005 | X0.660 TUNNEL INTERFACE | | SUPPORT - AFT | 1½ X 4 X .247 X 69 CHANNEL | 38 | CARBON STEEL ASTM-A-36 | | | | | | | | |
| | 1.2.3.1.1.a<br>1.2.1.1.c | B/M | C | 1 | 4003-00-000 | PRIMARY LONGERON FITTING, NON-DEPLOYABLE PAYLOAD | | | | | | | | | | | | | |
| | | B/M | C | 1 | 4003-01-000 | | JOURNAL ASSEMBLY | | | | | | | | | | | | |
| | | B/M | C | 1 | 4003-01-001 | | | UPPER JOURNAL | 5 X 5 X 13 FORGING | | STEEL | | | | | | | | |
| | | B/M | C | 1 | 4003-01-002 | | | LOWER JOURNAL | 5 X 6 X 13 FORGING | | STEEL | | | | | | | | |
| | | B | C | 1 | 4003-01-003 | | | BEARING - BALL * | 2.00" X 4.200 SPHERICAL BEARING | | INCONEL 718 AMS 5663 | | | | | | | | |
| | | M | C | 2 | 4003-01-004 | | | SHEAR PIN | .875 DIA X 1 LONG | | STEEL A-286 STEEL | | | | | | | | |
| | | B | C | 1 | 4003-01-005 | | | BEARING - RACE * | 1.750 X 5.375 DIAMETER | | AMS 5737 | | | | | | | | |
| | | M | C | 1 | 4003-01-006 | | | JOURNAL LOCK PIN | 2.0 DIA X 3.125 LONG | | STEEL | | | | | | | | |
| | | M | C | 1 | 4003-01-007 | | | JOURNAL LOCK BOLT | 1.0 DIA X 3.0 LONG | | STEEL | | | | | | | | |
| | | B | C | 1 | 4003-01-008 | PRIMARY LONGERON FTG. | JOURNAL ASSEMBLY | BOLT | 1.0 DIA. X 4.50 LONG | | STEEL | | | | | | | | |

ORIGINAL PAGE IS OF POOR QUALITY

# IVE HARD[illegible]E UTILIZATION LIST

SOURCE: M = MAKE, B = BUY, O = OFF THE SHELF
CONFIGURATION: H = HORIZONTAL, V = VERTICAL, C = COMMON
TEST REQMTS.: X = TEST REQUIRED, I = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | OPTIONAL EQUIPMENT NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR REQUIREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | LIFE/AGING | SUB-SYSTEM | SYSTEM | SPARES. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.3.1.1.C<br>1.2.4.1.1.2 | M | C | 1 | 4104-00-000 | - AUXILIARY KEEL FITTING | | | 7 x 8 1/2 x 2 | 21 | STEEL | | | | | | | | | |
| | 1.2.3.1.1.J | M | H | 1 | 4105-00-000 | P/L UPPER CLEARANCE GAGE | | | | .73 | | | | | | | | | | |
| | | M | H | 2 | 4105-01-000 | | LEG SUPPORT ASSY. | | | 25 | | | | | | | | | | |
| | | M | H | 2 | 4105-01-001 | | | STIFFENER | 1 1/2 X 2 X .060 X 92 ANGLE | 2 | AL. EXTRUSION | | | | | | | | | |
| | | M | H | 2 | 4105-01-002 | | | STIFFENER | 1 1/2 X 2 X .060 X 58 ANGLE | 1.2 | AL. EXTRUSION | | | | | | | | | |
| | | M | H | 1 | 4105-01-003 | | | PANEL | 38 1/2 X 97 X .060 SHEET | 11 | AL. SHEET | | | | | | | | | |
| | | M | H | 1 | 4105-01-004 | | | GUSSET | 4 X 20 X 11 X .060 CHANNEL | .6 | AL. SHEET | | | | | | | | | |
| | | M | H | 8 | 4105-01-005 | | | STIFFENER | 1 1/2 X 2 X .060 X 7 ANGLE | .2 | AL. EXTRUSION | | | | | | | | | |
| | | M | H | 1 | 4105-01-006 | | | ROLLER SUPPORT, L.S. | 4 X 10 X .250 SHEET | 1 | AL SHEET | | | | | | | | | |
| | | M | H | 1 | 4105-01-007 | | | ROLLER SUPPORT, RS | 4 X 10 X .250 SHEET | 1 | AL. SHEET | | | | | | | | | |
| | | M | H | 2 | 4105-01-008 | | | ROLLER | 2.5 DIA X 1.5 LONG | .7 | AL. ROD | | | | | | | | | |
| | | M | H | 2 | 4105-01-009 | | | SPACER | 1.5 DIA X 1 LONG | .2 | AL. ROD | | | | | | | | | |
| | | B | H | 2 | 4105-01-010 | | LEG SUPPORT ASSY. | BOLT | .50 DIA. X 3 LONG | .8 | AL. ALLOY | | | | | | | | | |
| | | M | H | 1 | 4105-02-000 | | HORIZONTAL SUPPORT ASSY | | | 13.6 | | | | | | | | | | |
| | | M | H | 1 | 4105-02-001 | | | PANEL | 15 X 92 X .060 SHEET | 8 | AL SHEET | | | | | | | | | |
| | | M | H | 2 | 4105-02-002 | | | STIFFENER | 1 1/2 X 2 X .060 X 92 ANGLE | 2 | AL. EXTRUSION | | | | | | | | | |
| | | M | H | 4 | 4105-02-003 | | HORIZONTAL SUPPORT ASSY. | STIFFENER | 1 1/2 X 2 X .060 X 15 ANGLE | 0.8 | AL EXTRUSION | | | | | | | | | |

# UTILIZATION LIST

SOURCE
S = SHUTTLE
O = ORBITY
E = ETM SHELF

CONFIGURATION
H = HORIZONTAL
V = VERTICAL
C = COMMON

TEST REQMTS.
T = TEST REQUIRED
I = QUANTITY NOT REQ'T

| MFG. PART NUMBER | SOURCE | CONFIGURATION | QUANTITY | ID NO. BY SYSTEM NUMBER | NOMENCLATURE: MODULE | NOMENCLATURE: ASSEMBLY | NOMENCLATURE: ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR SPECIFICATION NUMBER | TEST REQMTS: DEVELOPMENT | TEST REQMTS: QUALIFICATION | TEST REQMTS: ACCEPTANCE | TEST REQMTS: REDUCED | TEST REQMTS: SUB-SYSTEM | TEST REQMTS: SYSTEM | TEST REQMTS: SPARE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12.3.11.2 | | | | 4105-00-000 | UPPER CLEARANCE GAGE (CONTD) | | | | | | | | | | | | | |
| | M | N | 4 | 4105-00-001 | | | PANEL ATTACH ANGLE | 9 X 15 X .375 SHEET -94% | 5.5 | AL SHEET | | | | | | | | |
| | O | N | 10 | 4105-00-002 | | | BOLT | .375 X 1½ LONG | .2 | AL ALLOY | | | | | | | | |
| | M | N | 2 | 4105-03-000 | | SIDE GAGE ASSY | | | 4.2 | | | | | | | | | |
| | M | N | 1 | 4105-03-001 | | | GAGE SEGMENT | 12 X .060 X 87 SHEET 50% | 1.6 | AL. SHEET | | | | | | | | |
| | M | N | 3 | 4105-03-002 | | | ATTACH CLIP | 2 X 2 X .060 X 2 ANGLE | .05 | AL EXTRUSION | | | | | | | | |
| | M | N | 1 | 4105-04-000 | | CENTER GAGE ASSY | | | 6.8 | | | | | | | | | |
| | M | N | 1 | 4105-04-001 | | | GAGE SEGMENT | 12 X .060 X 90 SHEET 50% | 6.5 | AL. SHEET | | | | | | | | |
| | M | N | 5 | 4105-03-002 | | CENTER GAGE ASSY. | ATTACH CLIP | SAME AS 4105-03-002 CLIP | .05 | AL. EXTRUSION | | | | | | | | |
| | M | N | 2 | 4105-00-003 | | | GUIDE RAIL INSTALLATION TOOL | 1½ X 3 X 3 X .188 X 240 SEE DESIGN TBD. | 37 | AL EXTRUSION | | | | | | | | |
| | | | | 4105-00-004 | - UPPER CLEARANCE GAGE | | | | | | | | | | | | | |
| 12.3.11.3 | M | N | 1 | 4106-00-000 | - LOWER CLEARANCE GAGE | | | | 154 | | | | | | | | | |
| | M | N | 1 | 4106-01-000 | | CENTER GAGE ASSY | | | 92.6 | | | | | | | | | |
| | M | N | 1 | 4106-01-001 | | | CENTER TEMPLATE | 16 X 88 X .188 SHEET -60% | 11.6 | AL SHEET | | | | | | | | |
| | M | N | 1 | 4104-01-002 | | | TEMPLATE SUPPORT | 39 X 73 X .188 SHEET -50% | 29.5 | AL SHEET | | | | | | | | |
| | M | N | 2 | 4106-01-003 | | | DIAGONAL SUPPORT | 11 X 21 X .125 SHEET -62% | 2.0 | AL SHEET | | | | | | | | |
| | M | N | 2 | 4106-01-004 | | | TRANSVERSE ANGLE | 1½ X 1½ X .125 X 57 ANGLE | .10 | AL EXTRUSION | | | | | | | | |
| | M | N | 2 | 4106-01-005 | | | BASE SUPPORT | 1⅜ X 2 X .125 X 20 CHANNEL | 1.5 | AL. EXTRUSION | | | | | | | | |
| | M | N | 4 | 4106-01-006 | | | ROLLER | 2¾ DIA X 1 ROD | .6 | AL ALLOY ROD | | | | | | | | |
| | B | N | 4 | 4106-01-007 | | | AXLE | .250 DIA X 1⅜ LONG BOLT | 0.1 | AL. ALLOY | | | | | | | | |
| | B | N | 4 | 4106-01-008 | | | NUT | .250 DIA NUT | – | AL ALLOY | | | | | | | | |
| | B | N | 9 | 4106-01-009 | | CENTER GAGE ASSY | WASHER / SHIM | | – | AL ALLOY | | | | | | | | |
| | M | N | 1 | 4106-00-001 | | | CENTER ROLLER GUIDE | ⅞ X 3¼ X .281 X 240 CHANNEL | 34. | AL. EXTRUSION | | | | | | | | |
| | M | N | 1 | 4106-00-002 | | | OUTER ROLLER GUIDE | ⅞ X 1½ X .125 X 240 CHANNEL | 10.6 | AL EXTRUSION | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

SOURCE: M = MAKE, B = BUY, O = OFF THE SHELF
CONFIGURATION: H = HORIZONTAL, V = VERTICAL, C = COMMON
TEST REQMTS.: X = TEST REQUIRED, 1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | OPTIONAL EQUIPMENT NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL / SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | RECEIVING | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.3.1.1.j | | | | 4106-00-000 | LOWER CLEARANCE GAGE (cont'd) | | | | | | | | | | | | | |
| | | M | H | 1 | 4106-02-000 | | SIDE GAGE ASSY. | | | 20 | | 80 | | | | | | | |
| | | M | H | 1 | 4106-02-001 | | | SIDE TEMPLATE | 13x66x.188 SHEET -85% | 10.5 | AL. SHEET | | | | | | | | |
| | | M | H | 1 | 4106-02-002 | | | DIAGONAL SUPPORT (FWD) | 11x19x.060 SHEET -50% | .6 | AL SHEET | | | | | | | | |
| | | M | H | 1 | 4106-02-003 | | | DIAGONAL SUPPORT (AFT) | 11x19x.060 SHEET -50% | .6 | AL. SHEET | | | | | | | | |
| | | | | 1 | 4106-02-004 | | | TEMPLATE SUPPORT | 1½x1½x.125x42 ANGLE | 1.6 | AL. SHEET | | | | | | | | |
| | | M | H | 2 | 4106-01-005 | | | BASE SUPPORT | 1⅛x2x.125x20 CHANNEL | 1.5 | AL. EXTRUSION | | | | | | | | |
| | | M | H | 4 | 4106-01-006 | | | ROLLER | 2¾ DIA x 1 ROD | .6 | AL ALLOY ROD | | | | | | | | |
| | | B | H | 4 | 4106-01-007 | | | AXLE | .250 DIA. x 1⅜ LONG BOLT | .1 | AL. ALLOY | | | | | | | | |
| | | M | H | 1 | 4106-02-005 | | | DIAGONAL | 10x16x.060 SHEET -32% | .5 | AL. SHEET | | | | | | | | |
| | | M | H | 1 | 4106-02-006 | | | DIAGONAL | 10x16x.060 SHEET | .5 | AL. SHEET | | | | | | | | |
| | | B | H | 1 | 4106-01-008 | | | NUT | .250 DIA | | AL. ALLOY | | | | | | | | |
| | | B | H | - | 4106-01-009 | | | WASHER / SHIM | | | | | | | | | | | |
| | | M | H | 1 | 4106-00-001 | | SIDE GAGE ASSY. | ROLLER GUARD | ⅛x3½x.250x240 CHANNEL | 34 | AL. EXTRUSION | | | | | | | | |
| | | M | H | 3 | 4106-00-003 | LOWER CLEARANCE GAGE | | SUPPORT BRACKET | 4x8x.188 SHEET 50% | .5 | AL. SHEET | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

SOURCE: M = MAKE, B = BUY, O = OFF THE SHELF
CONFIGURATION: H = HORIZONTAL, V = VERTICAL, C = COMMON
TEST REQMTS.: X = TEST REQUIRED, 1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | OPTIONAL EQUIPMENT NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT LBS. | MATERIAL/SPEC. | DRAWING SIZE/DOCUMENT NUMBER | TEST REQMTS: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | PROTO/FLT | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12.3.1.1.K | M | C | 1 | 4107-00-000 | OMS ΔV ENVELOPE | | | DESIGN IS TBD. USE TYPICAL JOY ADD ON APPROACH. | — | — | | | | | | | | |
| | | M | C | 1 | 4107-01-000 | | 500 FPS Δ VELOCITY | | | | | | | | | | | | |
| | | M | C | 1 | 4107-02-000 | | 1000 FPS Δ VELOCITY | | ADD ON TO BASIC 500 FPS | | | | | | | | | | |
| | | M | C | 1 | 4107-03-000 | OMS ΔV ENVELOPE | 1500 FPS Δ VELOCITY | | ADD ON TO 1000 FPS. | | | | | | | | | | |
| | 12.3.3.1.e | M | H | 1 | 4108-00-000 | FLOODLIGHT X0 576 BULKHD. | | | | 2.4 | | | | | | | | | |
| | | B | H | 1 | 4108-00-001 | | | DOCKING FLOODLIGHT | LIGHT SELECTION TBD. | 2 | | | | | | | | | |
| | | M | H | 2 | 4108-00-002 | | | BRACKET | 4 X 8 X .060 SHEET | 1.2 | AL. ALLOY | | | | | | | | |
| | | M | H | 1 | 4108-00-003 | | | WIRE HARNESS | | | | | | | | | | | |
| | | B | C | 1 | 4108-00-004 | FLOODLIGHT - X0 576 BULKHD. | | SWITCH | | | | | | | | | | | |
| | 12.1.2.2.05 12.3.3.1.f | M | C | 4 | 4009-00-000 | X0 576 PAYLOAD SERVICE PANEL | | | | 2.8 | | | | | | | | | |
| | | M | C | 1 | 4009-01-000 | | SERVICE PANEL ASSY | | | 2.8 | | | | | | | | | |
| | | M | C | 1 | 4009-02-001 | | | PANEL | 8 X 16 X .188 SHEET -25% | 1.8 | AL. SHEET | | | | | | | | |
| | | B | C | 9 | 4009-03-002 | X0 576 PAYLOAD PANEL | SERVICE PANEL ASSY | CONNECTOR-FEED THRU | NSL 57N FEED-THRU CONNECTOR DEUTSCH ELECTRIC CO. | .1 | | 40M38277 CONTROL SPEC. | | | | | | | |
| | 12.3.2.1.9 | | H | 1 | 4110-00-000 | ENVIROMENTAL CONTROL UNIT SET | | | DESIGN IS TBD | — | | | | | | | | | |
| | | B | H | 1 | 4110-01-000 | | HEAT EXCHANGER | | | | | | | | | | | | |
| | | M | H | 1 | 4110-02-000 | | CONTROL & DISPLAY | | | | | | | | | | | | |
| | | B | H | 1 | 4110-03-000 | | PURGE & TEST | | | | | | | | | | | | |
| | | B | H | 1 | 4110-04-000 | | FLUID LINES SET | | | | | | | | | | | | |
| | | M | H | 1 | 4110-05-000 | ENVIROMENTAL CONTROL UNIT SET | INTERFACE PANEL ASSY. | | | | | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

SOURCE: M = MAKE, B = BUY, O = OFF THE SHELF
CONFIGURATION: H = HORIZONTAL, V = VERTICAL, C = COMMON
TEST REQMTS.: X = TEST REQUIRED, I = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | OPTIONAL EQUIPMENT NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | REFERENCE | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 3 | 4111-00-000 | CASTERS | | | | 655 | | | | | | | | | |
| | | B | H | 4 | 4111-01-000 | | CASTER ASSY - SWIVEL | | NO. 503N12-1800 AEROL CO. INC. | 90 | L.A. CALIF. | | | | | | | | |
| | DELETED | M | H | 2 | 4111-00-001 | | | DIAGONAL-SUPPORT | 2X2 X .250 X 43 TUBE | 19 | CARBON STEEL ASTM-A500 | | | | | | | | |
| | | M | H | 2 | 4111-00-002 | | | PLATE-SUPPORT | 11 X 25 X .375 PLATE | (12.1) EA | CARBON STEEL ASTM A 36(1) | DELETED | | | | | | | |
| | | M | H | 4 | 4111-00-003 | | | ANGLE-ATTACH | 8 X 10 X 1 X 11 ANGLE | 35 | CARBON STEEL ASTM-A36 | | | | | | | | |
| | | M | H | 4 | 4111-00-004 | | | DIAGONAL | 6 X 6 X .75 PLATE | | H | | | | | | | | |
| | | B | H | 12 | 4111-00-005 | CASTERS | | BOLT | .50 DIA X 2 | .2 | | | | | | | | | |
| | 1.5.1 | M | C | 1 | 4012-00-000 | HOISTING | | | | 761 | | | | | | | | | |
| | | M | C | 2 | 4012-00-001 | | | BEAM-SPREADER | MC10 X 21.9 X 204" CHANNEL | 372 (3=6) | CARBON STEEL ASTM-A36 | | | | | | | | |
| | | M | C | 4 | 4012-00-002 | | | ATTACH LUG | 4 X 4 X .750 PLATE | 3.4 | CARBON STEEL ASTM A 36 (1) | | | | | | | | |
| | | B | C | 4 | 4012-00-003 | | | CLEVIS | 3/4 DIA BOLT | .5 | STEEL ALLOY | | | | | | | | |
| | | B | C | 6 | 4012-00-004 | HOISTING | | BOLT | .50 DIA X 2 | .2 | STEEL ALLOY | | | | | | | | |
| | 1.5.1. | M | H | 1 | 4013-00-000 | TOWING | (USE R.I. STANDARD | 11EH-B-0244 TOW BAR) | | 280 | | | | | | | | | |
| | | M | H | 2 | 4013-01-000 | | ATTACH ASSY (L & R) | | | 195 | | | | | | | | | |
| | | M | H | 1 | 4013-01-001 | | | ATTACH ANGLE | 6 X 6 X .375 X 4 ANGLE | 5 (14.1) | CARBON STEEL ASTM-A36 | | | | | | | | |
| | | M | H | 1 | 4013-01-002 | | | LUG | 4 X 4 X .75 PLATE | 3.4 (14.1) | CARBON STEEL ASTM A 36(1) | | | | | | | | |
| | | B | H | 4 | 4013-01-003 | | ATTACH ASSY. | BOLT | .50 DIA. X 2 LONG | .2 | STEEL ALLOY | | | | | | | | |
| | DELETED | M | H | 1 | 4013-02-000 | | TONGUE ASSY | | | 259 | | DELETED | | | | | | | |
| | | M | H | 2 | 4013-02-001 | | | TOW BAR (L & R) | 3" DIA X .250 X 140" TUBE | (1.34) 86 | CARBON STEEL ASTM-A36 | | | | | | | | |
| | | M | H | 1 | 4013-02-002 | | | CROSS BAR | 3" DIA. X .250 X 120" TUBE | 74 | CARBON STEEL ASTM-A36 | | | | | | | | |
| | | B | H | 2 | 4013-02-003 | | | CLEVIS | 3/4 DIA. BOLT | .5 | STEEL ALLOY | | | | | | | | |
| | | B | H | 1 | 4013-02-004 | TOWING | TONGUE ASSY | RING | 1.5 DIA X 6" O.D. | 12 | STEEL | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

SOURCE
M = MAKE
B = BUY
O = OFF THE SHELF

CONFIGURATION
H = HORIZONTAL
V = VERTICAL
C = COMMON

TEST REQMTS.
X = TEST REQUIRED
1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | OPTIONAL EQUIPMENT NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | PEGGING | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.3.3.1.C | | C | 1 | 4014-00-000 | TV, X-576 BULLHEAD | | | | | | | | | | | | | |
| | | | C | 1 | 4014-01-000 | | TV CAMERA ASSY | | | | | | | | | | | | |
| | | B | C | 1 | 4014-01-001 | | | CAMERA, B & W | COHO MODEL 4440 | | | | | | | | | | |
| | | B | C | 1 | 4014-01-002 | | | LENS | CANNON 15-105 MM ZOOM | | | | | | | | | | |
| | | B | C | 1 | 4014-01-003 | | | HEAD-TILT & PAN | PELCO # 550 | | | | | | | | | | |
| | | B | C | 1 | 4014-01-004 | | TV CAMERA ASSY. | VIDICON TUBE | RCA # 8521 | | | | | | | | | | |
| | | M | C | 1 | 4014-02-000 | | REMOTE CONTROL UNIT | | | | | | | | | | | | |
| | | B | C | 1 | 4014-02-001 | | | ZOOM CONTROL | PELCO | | | | | | | | | | |
| | | B | C | 1 | 4014-02-002 | | | TILT & PAN CONTROL | PELCO | | | | | | | | | | |
| | | M | C | 1 | 4014-02-003 | | REMOTE CONTROL UNIT | CONTROL PANEL | | | AL SHEET | | | | | | | | |
| | | M | C | 1 | 4014-03-000 | | CAMERA INSTL. | | | | | | | | | | | | |
| | | M | C | 1 | 4014-03-001 | | | BASE | 15 X 10 X .050 | | AL SHEET | | | | | | | | |
| | | M | C | 2 | 4014-03-002 | | | BRACKET | 15 X 6 X .050 | | AL SHEET | | | | | | | | |
| | | M | C | 1 | 4014-03-003 | | CAMERA INSTL. | CABLE SET | POWER, CONTROL & MONITOR | | | | | | | | | | |
| | | B | C | 1 | 4014-04-000 | | TV MONITOR, ASSY | | | | | | | | | | | | |
| | | B | C | 1 | 4014-04-001 | | | MONITOR UNIT | SONY # 980 - 9" SCREEN | | | | | | | | | | |
| | | M | C | 1 | 4014-04-002 | | | BASE | 12 X 12 X .050 | | AL. SHEET | | | | | | | | |
| | | M | C | 2 | 4014-05-003 | TV, X-576 | TV MONITOR ASSY | BRACKET | 6 X 12 X .050 | | AL SHEET | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

**SOURCE**
M = MAKE
B = BUY
O = OFF THE SHELF

**CONFIGURATION**
H = HORIZONTAL
V = VERTICAL
C = COMMON

**TEST REQMTS.**
X = TEST REQUIRED
1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | OPTIONAL EQUIPMENT NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR EQUIPMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | RETESTING | SUB-SYSTEM | SYSTEM | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.3.3.1.C | | H | 1 | 4115-00-000 | TV Xo 1307 BULKHEAD | | | | | | | | | | | | | |
| | | B | H | 1 | 4115-01-000 | | TV CAMERA ASSY. | | | | | | | | | | | | |
| | | B | H | 1 | 4115-01-001 | | | CAMERA, C & W | COHO MODEL 4410 | | | | | | | | | | |
| | | B | H | 1 | 4115-01-002 | | | LENS | CANNON, 15-105 MM ZOOM | | | | | | | | | | |
| | | B | H | 1 | 4115-01-003 | | | TILT & PAN HEAD | PELCO MODEL 550 | | | | | | | | | | |
| | | B | H | 1 | 4115-01-004 | | TV CAMERA ASSY | VIDICON TUBE | RCA # 8521 | | | | | | | | | | |
| | | M | H | 1 | 4115-02-000 | | REMOTE CONTROL UNIT. | | | | | | | | | | | | |
| | | B | H | 1 | 4115-02-001 | | | ZOOM CONTROL | PELCO | | | | | | | | | | |
| | | B | H | 1 | 4115-02-002 | | | TILT & PAN CONTROL | PELCO | | | | | | | | | | |
| | | M | H | 1 | 4115-02-003 | | REMOTE CONTROL UNIT | CONTROL PANEL | | | AL. SHEET | | | | | | | | |
| | | M | H | 1 | 4115-03-000 | | CAMERA INSTL. | | | | | | | | | | | | |
| | | M | H | 1 | 4115-03-001 | | | BASE | 12 X 18 X .050 | | AL. SHEET | | | | | | | | |
| | | M | H | 2 | 4115-03-002 | | | SUPPORT-VERTICAL | 2 X 2 X .060 X 60 ANGLE | | EXTRUSION | | | | | | | | |
| | | M | H | 2 | 4115-03-003 | | | BRACKET | 8 X 18 X .060 SHEET. | | AL SHEET | | | | | | | | |
| | | M | H | 1 | 4115-03-004 | | CAMERA INSTL. | CABLE SET | POWER, CONTROL & MONITOR | | | | | | | | | | |
| | | M | H | 1 | 4115-04-000 | | TV MONITOR ASSY | | | | | | | | | | | | |
| | | B | H | 1 | 4115-04-001 | | | MONITOR UNIT | SONY 900, 9" SCREEN | | | | | | | | | | |
| | | M | H | 1 | 4115-04-002 | | | BASE | 12 X 12 X .050 | | AL. SHEET | | | | | | | | |
| | | M | H | 2 | 4115-04-003 | TV, Xo 1307 | TV MONITOR ASSY | BRACKET | 6 X 12 X .050 | | AL. SHEET | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

SOURCE: M = MAKE, B = BUY, O = OFF THE SHELF
CONFIGURATION: H = HORIZONTAL, V = VERTICAL, C = COMMON
TEST REQMTS.: K = TEST REQUIRED, # = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | OPTIONAL EQUIPMENT NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | PROTOTYPE | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.3.3.1.1.1 | M | H | 3 | 4116-00-000 | PAYLOAD BAY LINER | | | | 493 | X 3 = 1479 | | | | | | | | |
| | | M | H | 14 | 4116-00-001 | | | FRAME | .90 X 2.40 X .050 X 100 INAT | 2.2 | N = 2/7 0" ALUM EXTRUSION | M5049-3521-0055 | | | | | | | |
| | | M | H | 4 | 4116-00-002 | | | FRAME-END | .75 X .875 X .063 X 100 ZEE | 1.5 | | AND10138-0704 | | | | | | | |
| | | M | H | 8 | 4116-00-003 | | | SUPPORT-LONGERON | 2.0 X 1.75 X .125 X 840 TEE | 11.4 | | AND10136-2008 | | | | | | | |
| | | M | H | 8 | 4116-00-004 | | | SUPPORT-LONGERON | SHEAR 1 X 2.00 X .050 X 60 ANGLE | .9 | AL. EXTRUSION | | | | | | | | |
| | | M | H | 6 | 4116-00-005 | | | BRACKET No. 1 (L&R) | 4 X 4 X .030 SHEET | .1 | AL. SHEET | | | | | | | | |
| | | M | H | 6 | 4116-00-006 | | | BRACKET NO. 2 (L&R) | 6 X 17 X .060 SHEET | .5 | | | | | | | | | |
| | | M | H | 6 | 4116-00-007 | | | BRACKET No. 3 (L&R) | 6 X 14 X .060 SHEET | .4 | | | | | | | | | |
| | | M | H | 6 | 4116-00-008 | | | BRACKET, NO. 4 (L&R) | 4 X 7 X .050 SHEET | .1 (.2#) | AL. SHEET | | | | | | | | |
| | | M | H | 4 | 4116-00-009 | | | LINING NO. 1 | 48 X 120 RVEX 3/4" - NO. 13 | 32 | L.C. STEEL EXPANDED METAL | | | | | | | | |
| | | M | H | 8 | 4116-00-010 | | | LINING NO. 2 | 36 X 120 RVEX 3/4" - NO. 13 | 24 | | | | | | | | | |
| | | M | H | 2 | 4116-00-011 | PAYLOAD BAY LINER | | LINING NO. 3 | 24 X 120 RVEX 3/4" - NO. 13 | 16 | L.C. STEEL EXPANDED METAL | | | | | | | | |
| | 1.2.3.3.1.d | M | C | 1 | 4017-00-000 | PREFLIGHT UMBILICAL ELECTRICAL PANEL | | | | 5 | | | | | | | | | |
| | | M | C | 1 | 4017-00-001 | | | UMBILICAL PANEL | 13 X 18 X .250 SHEET | 5 | AL. SHEET | | | | | | | | |
| | | M | C | TBD | 4017-00-002 | PREFLIGHT UMBILICA | | ELECTRICAL CONNECTOR | LOCATION & NUMBER ARE TBD. | | | | | | | | | | |
| | 1.2.3.3.2.1.d | M | C | 1 | 4018-00-000 | PREFLIGHT UMBILICAL FLUID PANEL | | | | 5 | | | | | | | | | |
| | | M | C | 1 | 4018-00-001 | | | UMBILICAL PANEL | 11 X 18 X .250 SHEET | 5 | AL SHEET | | | | | | | | |
| | | M | C | TBD | 4018-00-002 | PREFLIGHT UMBILICAL FLUID PANEL | | FLUID COUPLING | LOCATION & NUMBER ARE TBD. | | | | | | | | | | |
| | 1.2.3.3.1.6 | M | C | 1 | 4019-00-000 | PAYLOAD BAY FLOODLIGHT | | | | 4.3 | | | | | | | | | |
| | | B | C | 6 | 4019-00-001 | | | FLOODLIGHT | 6 X 12 X 4" BOX (LIGHT TBD) | 4. | | | | | | | | | |
| | | M | C | 2 | 4019-00-002 | | | BRACKET } UPPER LIGHT BRACKET } | 10 X 10 X .060 SHEET | .6 | AL. SHEET | | | | | | | | |
| | | M | C | 2 | 4019-00-003 | | | | 10 X 10 X .060 SHEET | .6 | AL. SHEET | | | | | | | | |
| | | M | C | 8 | 4019-00-004 | | | BRACKET } LOWER BRACKET } LIGHTS | 20 X 22 X .060 SHEET | 2.6 | AL. SHEET | | | | | | | | |
| | | M | C | 4 | 4019-00-005 | | | | 15 X 18 X .060 SHEET | 1.6 | AL. SHEET | | | | | | | | |
| | | M | C | 6 | 4019-00-006 | | | WIRE HARNESS SWITCH | | TBD. | | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

SOURCE: M = MAKE, B = BUY, O = OFF THE SHELF
CONFIGURATION: H = HORIZONTAL, V = VERTICAL, C = COMMON
TEST REQMTS.: X = TEST REQUIRED, 1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | OPTIONAL EQUIPMENT NOMENCLATURE: MODULE | ASSEMBLY | ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUALIFICATION | ACCEPTANCE | RETESTING | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.1.1.1.6 | M | H | 1 | 4120-00-000 | X0 1307 BULKHEAD | | | | 325 | | | | | | | | | |
| | | M | H | 1 | 4120-01-000 | ↓ | BULKHEAD ASSY. | SIMILAR TO X0 576 BULKHEAD ASSY IN DESIGN, MATERIAL AND FABRICATION. ALL ESTIMATES SHOULD BE BASED ON X0 576 BULKHEAD PLUS A FACTOR OF 3. | | | | | | | | | | |
| | | M | H | 1 | 4120-02-000 | X0 1307 BULKHEAD | BULKHEAD ASSY. | | | | | | | | | | | | |
| | 1.2.3.2.1.6 | M | H | 1 | 4121-00-000 | X0 1307 P/L OXIDIZER/FUEL PANELS | | | | 50 | | | | | | | | | |
| | | M | H | 1 | 4121-01-000 | | OXIDIZER PANEL ASSY (LS) | | | 18.6 | | | | | | | | | |
| | | M | H | 1 | 4121-01-001 | | | PANEL | 12 X 12 X .250 SHEET | 3.6 | AL. SHEET | | | | | | | | |
| | | B | H | 1 | 4121-01-002 | | | FLUID COUPLING (M) | 6" DIA | 11 | STAINLESS STEEL | | | | | | | | |
| | | M | H | 1 | 4121-02-000 | | OXIDIZER PANEL PANEL (LS) | | | 5.2 | | | | | | | | | |
| | | M | H | 1 | 4121-02-001 | | | PANEL | 12 X 12 X .250 SHEET | 3.6 | AL. SHEET | | | | | | | | |
| | | B | H | 1 | 4121-02-002 | | | COUPLING | 1" DIA. | 1 | STAINLESS | | | | | | | | |
| | | B | H | 1 | 4121-02-003 | | | COUPLING | 1/2" DIA. | .6 | STAINLESS | | | | | | | | |
| | | M | H | 1 | 4121-03-000 | | FUEL PANEL ASSY (RS) | | | 15.6 | | | | | | | | | |
| | | M | H | 1 | 4121-03-001 | | | PANEL | 12 X 12 X .250 SHEET | 3.6 | AL. SHEET | | | | | | | | |
| | | B | H | 1 | 4121-03-002 | | | FLUID COUPLING (M) | 3.5" DIA | 7. | STAINLESS | | | | | | | | |
| | | B | H | 1 | 4121-03-003 | | | FLUID COUPLING (M) | 2.5" DIA | 5 | STAINLESS | | | | | | | | |
| | | M | H | 1 | 4121-04-000 | | FUEL PANEL ASSY (RS) | | | 14.6 | | | | | | | | | |
| | | M | H | 1 | 4121-04-001 | | | PANEL | 12 X 12 X .250 SHEET | 3.6 | AL SHEET | | | | | | | | |
| | | B | H | 1 | 4121-04-002 | | | FLUID COUPLING (M) | 4" DIA. | 8 | STAINLESS | | | | | | | | |
| | | B | H | 1 | 4121-04-003 | | | FLUID COUPLING (M) | 1 1/2" DIA. | 2. | ↓ | | | | | | | | |
| | | B | H | 1 | 4121-04-004 | X0 1307 P/L OXIDIZER/FUEL PANELS | | FLUID COUPLING (M) | 1" DIA. | 1 | STAINLESS | | | | | | | | |

# IVE HARDWARE UTILIZATION LIST

SOURCE
M = MAKE
B = BUY
O = OFF THE SHELF

CONFIGURATION
H = HORIZONTAL
V = VERTICAL
C = COMMON

TEST REQMTS.
X = TEST REQUIRED
1 = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | TEST EQUIPMENT NOMENCLATURE: MODULE | TEST EQUIPMENT NOMENCLATURE: ASSEMBLY | TEST EQUIPMENT NOMENCLATURE: ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | TEST REQMTS.: QUALIFICATION | TEST REQMTS.: ACCEPTANCE | TEST REQMTS.: SYNTHESIS | TEST REQMTS.: SUB-SYSTEM | TEST REQMTS.: SYSTEM | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.5.1. | M | H | 1 | 4122-00-000 | PAYLOAD MASS SIMULATOR | | | | 65,000 | | | | | | | | | |
| | | M | H | 1 | 4122-01-000 | | BALLAST ASSEMBLY | | | 62,520 (4) | | | | | | | | | |
| | | M | H | 1 | 4122-01-001 | | | SUPPORT BEAM | WF 11½ x 16 x 15' I BEAM | 1440 | STEEL | | | | | | | | |
| | | M | H | 12 | 4122-01-002 | | | REINFORCING ROD | 1" DIA X 14 FEET 2,67 | 37.4 | STEEL | | | | | | | | |
| | | M | H | 180 | 4122-01-003 | | | BALLAST | | 62,376 | CONCRETE | | | | | | | | |
| | | M | H | 2 | 4122-01-004 | | | HOIST/END PLATE | 15 x 31 x 1 PLATE | 132 | STEEL | | | | | | | | |
| | | M | H | 4 | 4122-01-005 | | BALLAST ASSEMBLY | GUSSET | 8 x 8 x 1 PLATE (30) | 9 | STEEL | | | | | | | | |
| | | M | H | 2 | 4122-02-000 | | TRUNNION ASSY | | | 69 | | | | | | | | | |
| | | M | H | 1 | 4122-02-001 | | | TRUNNION | DIA X 12 ROD. (804) | 28 | STEEL | | | | | | | | |
| | | M | H | 1 | 4122-02-002 | | TRUNNION ASSY. | PLATE | 12 x 12 x 1. PLATE | 41 | STEEL | | | | | | | | |
| | | M | H | 8 | 4122-00-001 | PAYLOAD MASS SIMULATOR | | BOLT | 1" DIA. x 3" | .7 | STEEL | | | | | | | | |

# IVE · HARDWARE UTILIZATION LIST

SOURCE
M = MAKE
B = BUY
O = OFF THE SHELF

CONFIGURATION
H = HORIZONTAL
V = VERTICAL
C = COMMON

TEST REQMTS.
X = TEST REQUIRED
I = QUANITY FOR TEST

| ITEM NUMBER | WBS NUMBER | SOURCE | CONFIGURATION | QUANITY | IDENTIFICATION NUMBER | OPTIONAL EQUIPMENT — NOMENCLATURE: MODULE | NOMENCLATURE: ASSEMBLY | NOMENCLATURE: ITEM | DESCRIPTION | WEIGHT | MATERIAL/SPEC. | DRAWING OR PROCUREMENT SPEC. NUMBER | TEST REQMTS.: DEVELOPMENT | QUAL/ACCEPTANCE | FLIGHTWIS | SUB-SYSTEM | SYSTEM | SPARES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2.3.2.1.a | M | H | 1. | 4124-00-000 | Xo 1307 ELECTRICAL SERVICE PANEL | | | | 9.4 | | | | | | | | |
| | | M | H | 1 | 4128-01-000 | | PANEL ASSY. (L.H.) | | | 4.7 | | | | | | | | |
| | | M | H | 1 | 4128-01-001 | | | PANEL (L.H.) | 12 X 12 X .250 SHEET | 3.5 | AL ALLOY | | | | | | | |
| | | B | H | 1 | 4128-00-001 | | | CONNECTOR - POWER | 36 SHELL SIZE CONNECTOR | .6 | AL ALLOY | | | | | | | |
| | | B | H | 2 | 4128-00-002 | | | CONNECTOR - SIGNAL | 22 SHELL SIZE CONNECTOR | .3 | AL ALLOY | | | | | | | |
| | | M | H | 1 | 4128-02-000 | | PANEL ASSY (R.H.) | | | 4.7 | | | | | | | | |
| | | M | H | 1 | 4128-02-001 | | | PANEL (R.H.) | 12 X 12 X .250 SHEET | 3.5 | AL ALLOY | | | | | | | |
| | | B | H | 1 | 4128-00-001 | | | CONNECTOR - POWER | 36 SHELL SIZE | .6 | AL ALLOY | | | | | | | |
| | | B | H | 2 | 4128-00-002 | Xo 1307 SERVICE MAL | PANEL ASSY (R.H.) | CONNECTOR - SIGNAL | 22 SHELL SIZE | .3 | AL ALLOY | | | | | | | |
| | ~~1.2.3.1.1.f~~ | ~~M~~ | ~~H~~ | ~~1~~ | ~~4125-00-000~~ | ~~KEEL FITTING, X-Y AND Y-Y LOADS~~ | | | ~~7 X 8 1/2 X 2~~ | ~~2.1~~ | ~~STEEL~~ | DELETED | | | | | | |
| | 1.2.1.1.1.d 1.2.3.1.6 | M | H | 1 | 4126-00-000 | STABILIZING LONGERON FITTING, NON-DEPLOYABLE PAYLOAD | | | IDENTICAL TO KIT 4003-00-000 EXCEPT SHEAR PIN (PN 4003-01-004) IS NOT REQUIRED. | | | | | | | | | |
| | 1.2.3.3.1.g | M | C | 1 | 4127-00-000 | CABLE SETS | | | | | | | | | | | | |
| | | M | C | 1 | 4127-01-000 | | Xo 1307 POWER CABLE SET | TBD | | | | | | | | | | |
| | | M | C | 1 | 4127-02-000 | CABLE SETS | Xo 1307/T-O CABLE SET | TBD | | | | | | | | | | |
| | 1.2.3.1.1.m | M | H | 1 | 4128-00-000 | T-O UMBILICAL PROVISIONS | | | | | | | | | | | | |
| | | M | H | 1 | 4128-01-000 | | L.H. PANEL ASSEMBLY | TBD | | | | | | | | | | |
| | | M | H | 1 | 4128-02-000 | T-O UMBILICAL PROV. | R.H. PANEL ASSEMBLY | TBD | | | | | | | | | | |
| | 1.2.3.2.1.c | M | H | 1 | 4129-00-000 | T-O UMBILICAL FLUID I/F ASSY. | | TBD | | | | | | | | | | |

ORIGINAL PAGE IS OF POOR QUALITY

# APPENDIX B

## HORIZONTAL IVE IN-FIELD ASSEMBLY PROCEDURE

## B-1. INTRODUCTION

This Appendix contains an in-field assembly procedure for the Horizontal IVE and assumptions/guidelines employed. The in-field assembly procedure was developed to increase the degree of confidence in the basic IVE design approach by identifying possible problem areas associated with the IVE design. An iterative procedure was used resulting in a compatible design and in-field assembly procedure as discussed in Section B-3 of this appendix.

## B-2. COMMENTS

The following comments apply to the procedures discussed in Section B-3 of this appendix.

1. The X, Y, Z coordinate system used in the IVE structure assembly procedure is the same as the Shuttle Orbiter coordinate system.

2. Special tools/aids required during the assembly of the IVE structure consists of two (2) spreader/hoist bars and two (2) master alignment tools which are contractor furnished.

3. No special tools are required to be provided by the User for the assembly of the structure. However, it is assumed that standard facility equipment such as an overhead hoist/crane, forklift, optical transit, targets, and levels will be available during assembly operations.

4. The assembly procedure is predicated upon the premise that the structure has been assembled, aligned, verified and disassembled by the Contractor prior to delivery to the User.

5. Upon completion of assembly and verification of alignment the nuts on all the bolted connections shall be "sealed" with a material similiar to locktite to prevent inadvertant loosening of bolts.

6. It is anticipated that at the 100% drawing completion milestone an identification code will be devised and each part of the IVE structure marked. The coding will be incorporated in the in-field assembly procedure to facilitate assembly by the User.

## B-3. IN-FIELD ASSEMBLY PROCEDURE

A. Section 2 Assembly. (See Figure B-1 View B)

A.1. Position 4 floor plates on floor to form rectangle approximately 16 feet by 20 feet.

A.2. Position 3 cross beams on support blocks between floor plates at 10 foot intervals.

A.3. Using overheat hoist, position right hand truss assembly on floor plates. Position end of cross beam between Horizontal attach plates at three places along bottom of truss assembly.

A.4. Bolt cross beams to truss assembly. (Do not torque bolts at this time).

A.5. Position and bolt right hand knee braces to truss assembly and three cross beams. (Do not torque bolts at this time).

A.6. Repeat Steps A.3, A.4 and A.5 for left hand truss assembly.

A.7. Detach overhead hoists from right and left hand truss assemblies.

A.8. Attach spreader bars to longeron at each end of Section assembly as shown in Figure B-1 View C.

A.9. Position diagonal tie rods below cross beams and attach to left and right truss assemblies.

A.10. Level bridge rails with floor screw jacks in the X and Y planes (Use facility optical equipment).

A.11. Square section assembly by adjusting tie rods.

A.12. Plumb truss assemblies in the vertical plane by adjusting knee braces.

A.13. Remove spreader bars from section assembly.

A.14. Position master alignment tool at each end of section assembly as shown in Figure B-1 View D and check alignment of shear pin holes in rails. If no fit, repeat steps A.10, A.11 and A.12 as required.

A.15. Install tooling dowel pins as provided for at the bolted connections.

A.16. Torque all bolts to specified values.

A.17. Position and attach two keel beams at $Y_O$ centerline.

A.18. Position and attach keel longerons to keel and cross beams. Check location using master alignment tool.

A.19. Install tooling dowel pins in keel beams and longerons.

A.20. Torque keel bolts to specified values.

A.21. Remove master alignment tools from section assembly.

A.22. Verify final alignment. (Assembly of Section 2 is complete).

Section 3 Assembly. (See Figure B-1 View E)

B.1. Position 2 floor plates on floor 20 feet aft of and in line with Section 2 assembly.

B.2. Position 3 cross beams on support blocks between floor plates at 10 foot intervals. (The 2 floor plates at Station $X_O$1063.3 are shared by Sections 2 and 3).

B.3. Using overhead hoist, position right hand truss assembly so upper longeron is in line with splice plate on Section 2 longeron and insert one bolt.

B.3.a Adjust screw jacks to align both upper and lower splice plates between sections 2 and 3 and install remaining bolts. (Do not torque bolts at this time).

B.4. Position end of cross beam between horizontal attach plates at three places along bottom of truss assembly and bolt cross beams to truss. (Do not torque bolts at this time).

B.5. Position and bolt right hand knee braces to truss assembly and three cross beams. (Do not torque bolts at this time).

B.6. Repeat steps B.3., B.3.a, B.4. and B.5 for left hand truss assembly.

B.7. Detach overhead hoist from left and right truss assemblies.

B.8. Attach spreader bar to longerons at aft end of Section 3 as shown in Figure B-1 View F.

B.9. Repeat Steps A.9 through A.13 for Section 3.

B.10. Position master alignment tool to span joint between Section 2 and 3 as shown in Figure B- View A. Position second alignment tool at af end of Section 3.

B.11. Check alignment of shear pin holes in rails a each tool. If no fit, repeat steps A.10, A.1 and A.12 as required.

B.12. Install tooling dowel pins as provided for at the bolted connections.

B.13. Torque all bolts to specified values.

B.14. Position and attach two keel beams to the cross beams at $Y_O$ centerline (Figure B-2 View A).

B.15. Attach Section 3 keel longerons to keel beams and check alignment of keel fitting attach holes with master alignment tool across Section joint at Station $X_O$ 1063.3.

B.16. Install tooling dowel pins in keel beams a longerons.

B.17. Torque keel bolts to specified values.

B.18. Remove master alignment tools from Section assembly.

B.19. Verify alignment of rails and keel longerons fo Section 2 and 3.

C. Section 1 Assembly. (See Figure B-2 View B)

C.1 Position 2 floor plates on floor 20 feet forward of and in line with Section 2 assembly.

C.2 Position 3 cross beams on support blocks between floor plates at 10 foot intervals. (The 2 floor plates at Station $X_O$819.66 are shared by Sections 1 and 2).

C.3 Using overhead hoist, position right hand truss assembly so upper longeron is in line with splice plate at forward end of Section 2 and insert one bolt.

C.4 Adjust screw jacks to align both upper and lower splice plates between Sections 1 and 2 and install remaining bolts. (Do not torque bolts at this time)

C.5 Position end of cross beam between horizontal attach plates at three places along bottom of truss assembly and bolt cross beams to truss. (Do not torque bolts at this time).

C.6. Position and bolt right hand knee braces to truss assembly and three cross beams. (Do not torque bolts at this time).

C.7. Repeat Steps C.3, C.4, C.5 and C.6 for left hand truss assembly.

C.8. Detach overhead hoist from left and right truss assemblies.

C.9. Attach spreader bar to longeron at forward end of Section 1.

C.10. Repeat Steps A.9 through A.13 for Section 1.

C.10.a Remove spreader bar from Section assembly.

C.11 Position master alignment tool to span joint between Section 1 and 2 as shown in Figure B-2 View C. Position second alignment tool at forward end of Section 1.

C.12. Check alignment of shear pin holes in rails at each tool. If no fit, repeat Steps A.10, A.11 and A.12 as required.

C.13. Install tooling dowel pins as provided for at the bolted connections.

C.14. Torque all bolts to specified values.

C.15. Position and attach two keel beams to cross beams at $Y_O$ centerline.

C.16. Attach Section 1 keel longerons to keel beams and check alignment of keel fitting attach holes with master alignment tool across Section joint at Station $X_O$819.66.

C.17. Install tooling dowel pins in keel beams and longerons.

C.18. Torque all bolts to specified values.

C.19. Remove master alignment tools from Section 1 assembly.

C.20. Verify alignment of rails and keel longerons Sections 1, 2 and 3 using transit and targets ixed to pin holes. The assembly of Sections 2 and 3 is complete.

MS/PS/OOS Support Structure. (See Figure B-2 View D)

D.1 Position left hand welded support assembly at Station $X_O$576 and $Y_O$=100 to index with upper and lower gusset attach plates on forward end of Section 1.

D.2 Position 3 floor plates under screw jacks at corners of support assembly. (The floor plate at the forward corner of Section 1 is shared with the support assembly).

D.3 Level and align L.H. support assembly with screw jacks.

D.4 Bolt gusset plates and vertical member of suppor assembly together at $X_O$576.

D.5 Install tooling dowel pins in gusset plates.

D.6 Repeat Steps D.1 through D.5 for right hand support assembly.

D.6.a Install floor beams connecting LH & RH support assemblies.

D.7 Install center floor panel between support assemblies at $Z_O$=419.

D.8 Install lower support assembly braces connecting LH and RH support assemblies.

D.9 Bolt handrails to floor panels on the left and right support assemblies.

$X_O$576 Bulkhead Assembly. (See Figure B-2 View D)

E.1 Using overhead hoist, position bulkhead assembly on top of MS/PS support assembly with aft face of bulkhead at station $X_O$=576.

E.2 Bolt lower attach angle of bulkhead to horizontal member of support assembly. (Do not torque bolts at this time).

E.3 Position and bolt 2 diagonal braces to bulkhead and floor structure. (Do not torque bolts at this time).

E.4 Center bulkhead on $Y_O$=0 scribe line and align aft surface of bulkhead in the vertical plane by adjusting diagonal braces.

E.5 Install tooling dowel pins as provided for in bolted connections.

E.5a Torque bolts to specified values.

E.6 Attach handrails to outboard edge of bulkhead structure.

F. $X_O$576 Bulkhead Assembly. (See Figure B-2 View E)

F.1 Assemble 3 panels of bulkhead together in a horizontal position.

F.2 Using overhead hoist, position bulkhead assemble at Station $X_O$1307 to mate with support angle (L and R side) attached to aft end of Section 3 assembly and bolt together. (Do not torque bolts at this time).

F.3 Center bulkhead on $Y_O$=0 scribe line and align forward surface of bulkhead in a vertical plane at Station $X_O$=1307.

F.4 Bolt lower half of bulkhead to attach structure on aft end on Section 3 assembly. (Do not torque bolts at this time).

F.5 Install tooling dowel pins as provided for at the bolted connections.

F.6 Torque all bolts to specified values.

G. Payload Wire Tray Assembly

G.1 Install wire tray attach clips to the knee braces on left and right sides of Section 1, 2 and 3 assemblies. Index to scribe lines on knee brace.

G.2 Position master alignment tool at each end of Section 1 assembly engaging rails and keel fitting. Attach wire tray index template to alignment tool.

G.3 Position 20 foot sections of wire tray assemblies between attach clips on knee braces on left and right side of Sections 1, 2 and 3.

G.4 Index wire tray assemblies to template at each end of Section 1 and bolt in place. Also bolt tray to center knee brace.

G.5 Repeat Steps G.2, G.3 and G.4 for Sections 2 and 3.

H. Payload I/F Elements

Install payload I/F elements as required. Include MS, PS, OOS enclosures, mid-body payload I/F's and optional equipment.

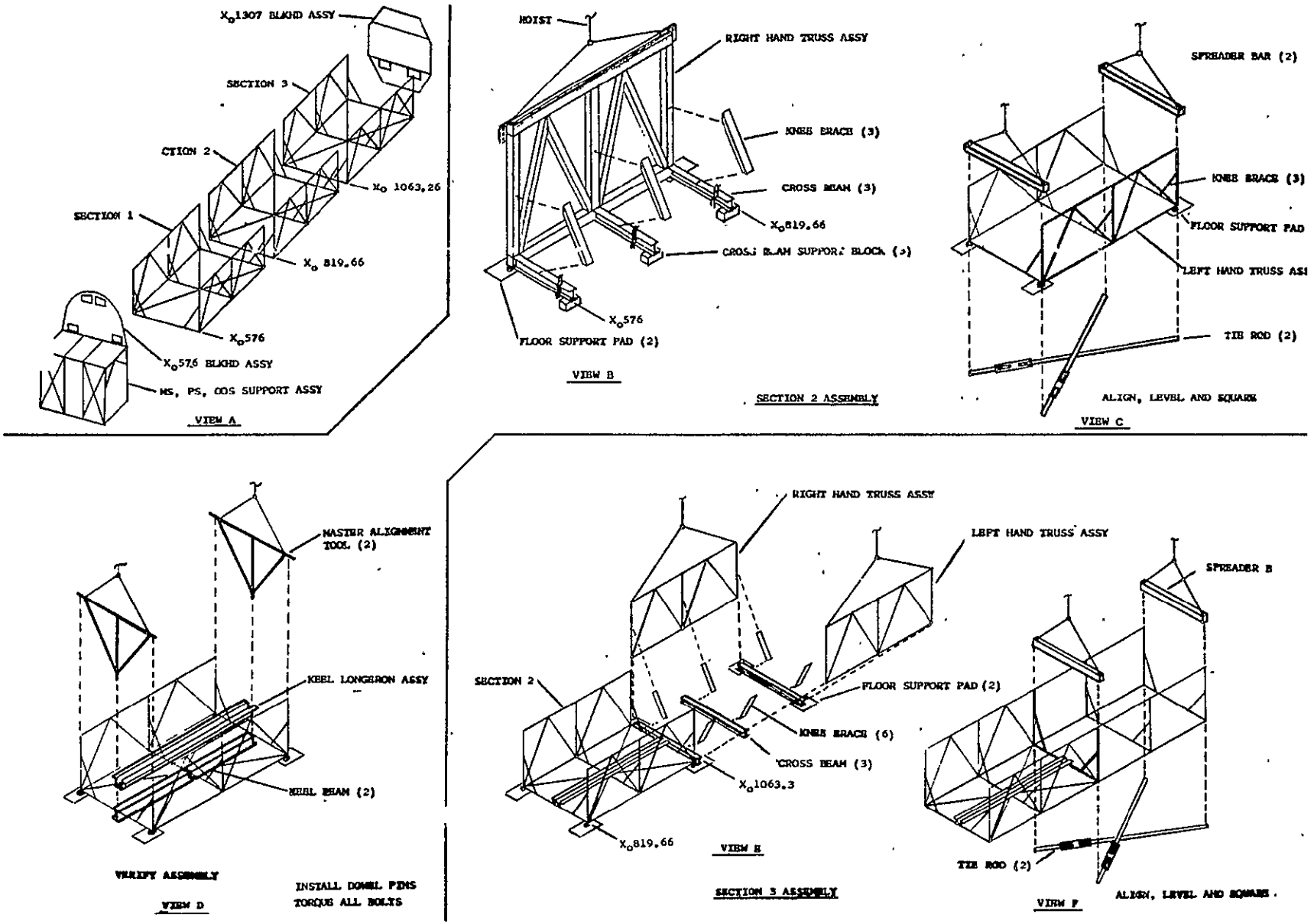



FIGURE B-1 HORIZONTAL IVE IN-FIELD ASSEMBLY PROCEDURE

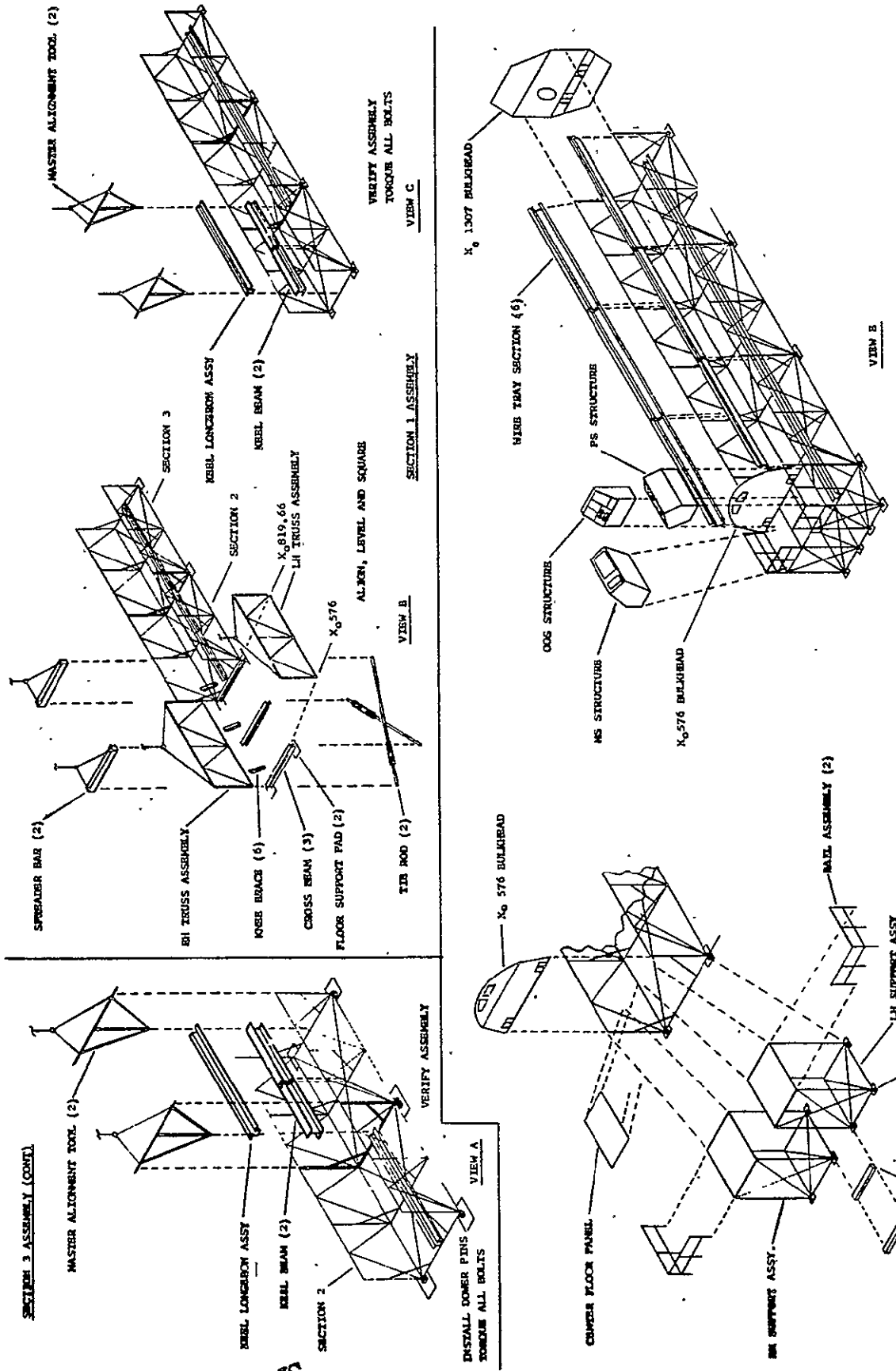



FIGURE B-2 HORIZONTAL IVE IN-FIELD ASSEMBLY PROCEDURE

# APPENDIX C

## PAYLOAD INTEGRATION BASELINE FUNCTIONAL FLOW BLOCK DIAGRAMS AND OPTIONS

TABLE OF CONTENTS

## ILLUSTRATIONS



## TABLES

# APPENDIX C

## PAYLOAD INTEGRATION BASELINE FUNCTIONAL FLOW BLOCK DIAGRAMS AND OPTIONS

### C.1 CONTENTS

This appendix contains the detailed descriptions of the payload integration functional flow block diagrams as described in Section 9.0 of the report. A baseline and two optional flows are included for the following five payloads representative of the broad payload spectrum:

1. Solar Maximum Mission
2. Solar Physics Dedicated Missi
3. Module With Pallet (Spacelab)
4. Large Space Telescope
5. Mariner Jupiter Orbiter/IUS

Contents include terminology used, baseline payload integration functional flow block diagrams, and interface checkout matrices identifying differences to the baseline flows for the two options.

### C.2 TERMINOLOGY

The following terminology and definitions apply to the data presented in the figures and tables in Section 3, of this appendi:

| | |
|---|---|
| Cargo | The total complement of payloads carried on any one flight. |
| Payload | The total complement of specific instruments, space equipment and support hardware carried in the Orbiter to accomplish a certain task in space. |
| Subsystem | The next functional subdivision of a system. |
| Assembly | The next functional subdivision of a component (two or more parts or subassemblies). |
| Subassembly | An assembly within a larger assembly. |

| | |
|---|---|
| Part | A basic element of component, assembly or subassembly. |
| Acceptance Tests | Acceptance tests are the required formal tests, conducted to demonstrate acceptability of an item for delivery. |
| Block Numbers in FFBD's | This indicates a sequential number of a block, as shown in the Functional Flow Block Diagram (FFBD) for a given payload processing operation. |
| Description | Title identification of the blocks in the FFBD's, the functions to be performed, and the operation level (subsystem, system, payload and cargo.) |
| I/F Knowledge | Four different categories of interface related requirements are reflected. They are as follows: |

(1) Orbiter I/F Not Required - This category does not interface with Orbiter.

(2) Orbiter I/F Knowledge Required - This category does not interface with Orbiter, but knowledge of Payload/Orbiter interface data is required.

(3) Direct Orbiter Function Simulated - In this category some of the Orbiter functions are required to be simulated.

(4) Direct Orbiter I/F - This category requires that the payload interfaces directly with Orbiter.

Baseline Location — Operational site location for the function identified as determined from the NASA payload data base.

Option 1 (User Oriented) — Operational site location for the function identified with maximum integration to be accomplished prior to payload delivery to the launch site.

Option 2 (Launch site oriented) — Operational site location for the function identified with maximum integration to be accomplished at the launch site.

GSE Simulators — Identifies integration functions requiring usage of IVE or GSE simulators.

IVE — Identifies interface functions, in the interface checkout matrix tables that can be accomplished by standardized IVE.

Special Facility — A special facility (thermo/vac, vibration or other) is required to perform a given function.

Remarks

Either Site - A given function may be performed at either User or Launch Site. The decision where to perform the function will depend on the results of a trade stud of other relevant functions, showing that the chosen site will not affect the operat However, if the function does not depend on a trade study, it can be performed at the site equipped with the required GSE simulators or IVE, taking into consideration the effects of factors like handling, transportation, risk, availability of personne etc.

Remarks (Cont)

Both Sites - A given function is to be performed at both sites (User & Launch). Final decision whether the function is to be performed at both sites depends on I/F verification philosophy such as: Whether minimum checkout is performed initially at User site, and maximum checkout at Launch site, or vice verse. Transportation and subsequent checkout and I/F verification requirements will influence the decision.

Trade Study — A study, required to determine the preferable site to perform a given function. Determination of site wil depend on evaluation of the factors, presented in the Criteria Table, such as risk, cost, schedule impact, availability of personnel and equipment, etc.

## C.3. PAYLOAD INTEGRATION ANALYSIS - FUNCTIONAL FLOW BLOCK DIAGRAMS AND INTERFACE CHECKOUT MATRICES

The FFBD's and I/F checkout matrix tables are included for the five payloads identified above. These data support the discussion in Section 9.0 of this report. Data presented in Figures C-1 through C-5 and Tables C.1 through C.5 reflect the next level definition of the payload integration processes described in Figure 9-2.

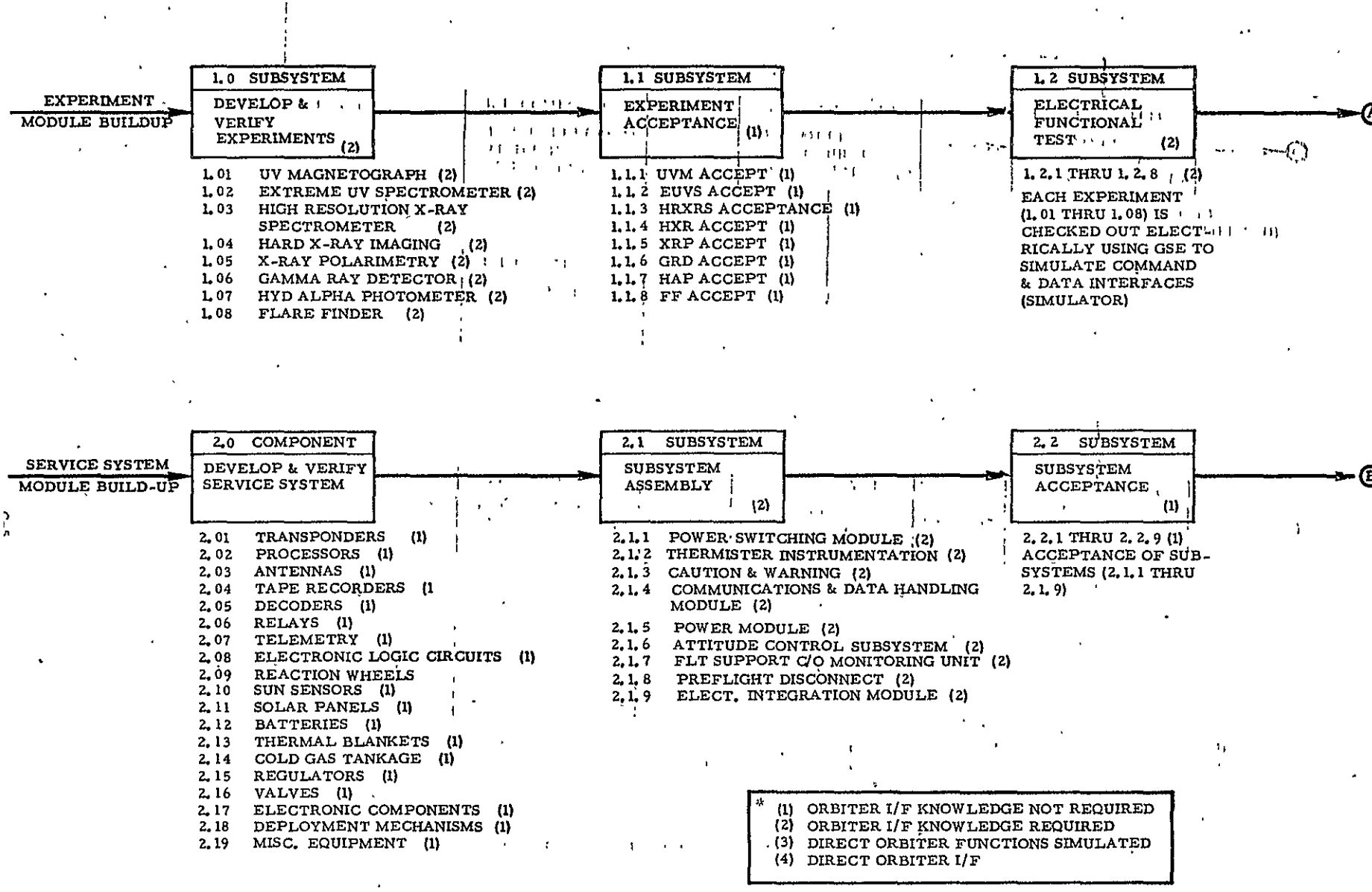



Figure C-1. Solar Maximum Mission FFBD

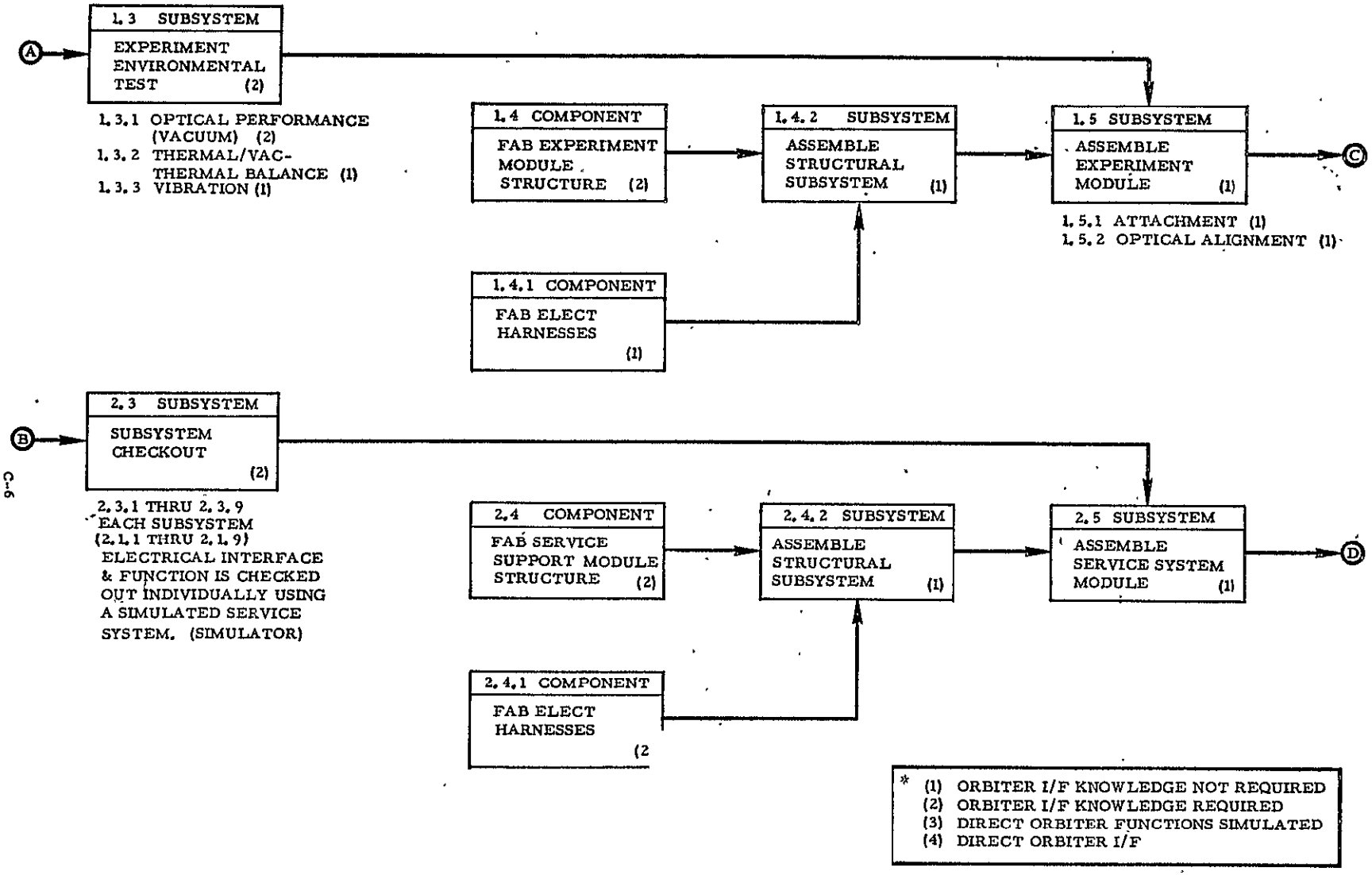



Figure C-1. Solar Maximum Mission FFBD (Cont)

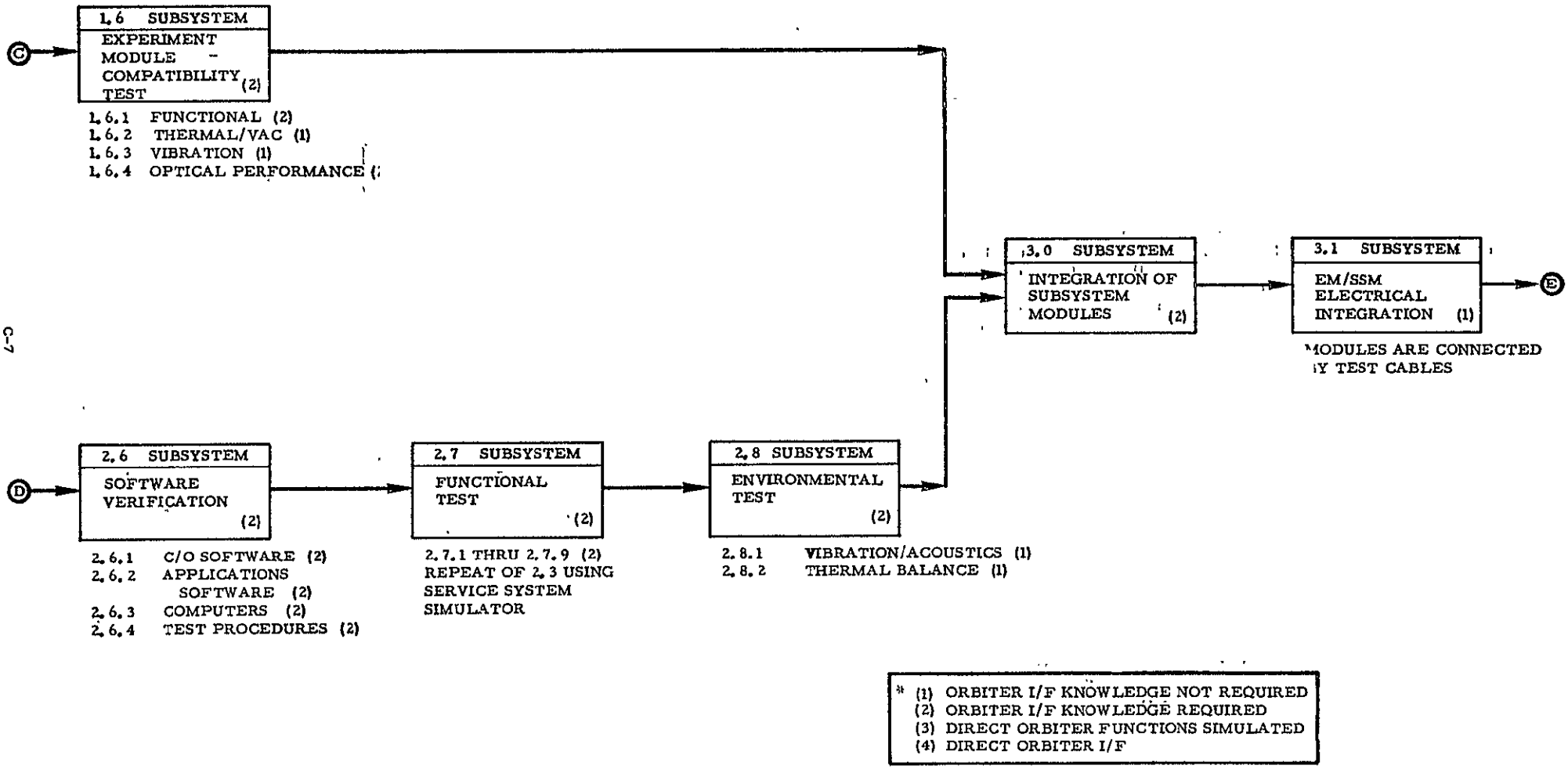



Figure C-1. Solar Maximum Mission FFBD (Cont)

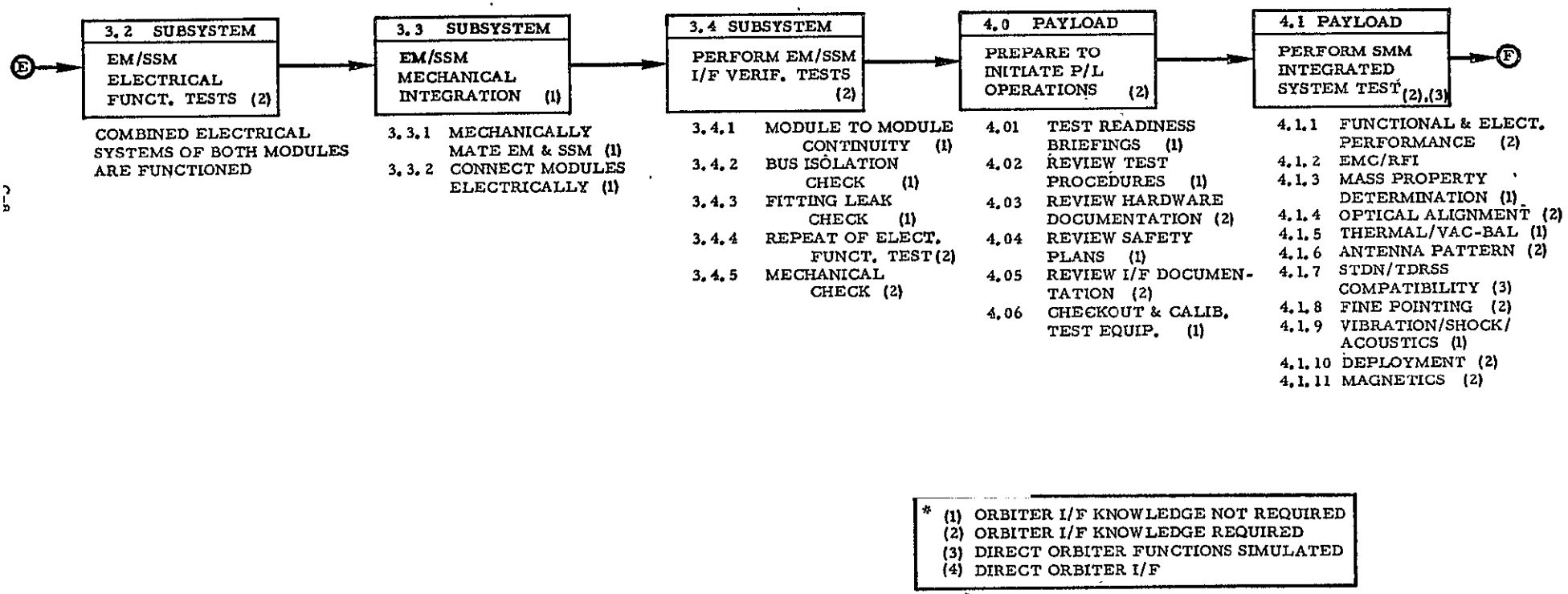
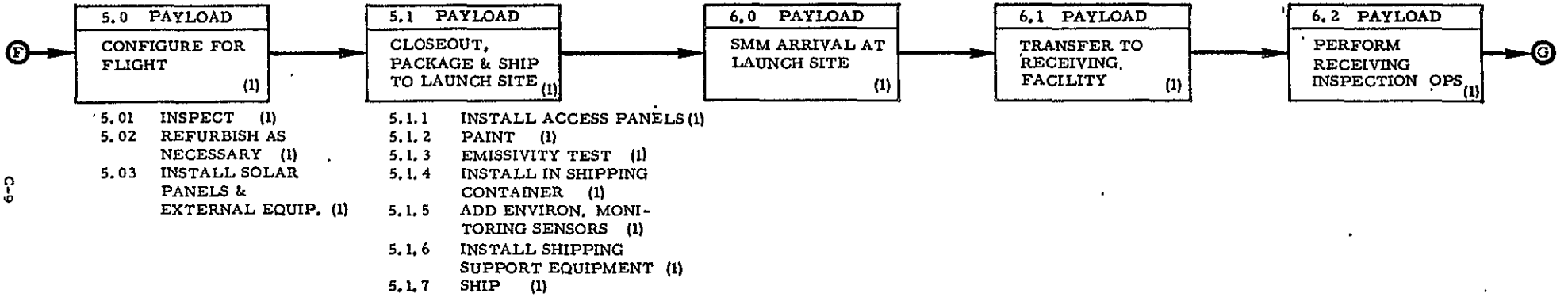



Figure C-1. Solar Maximum Mission FFBD (Cont)




* (1) ORBITER I/F KNOWLEDGE NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-1. Solar Maximum Mission FFBD (Cont)

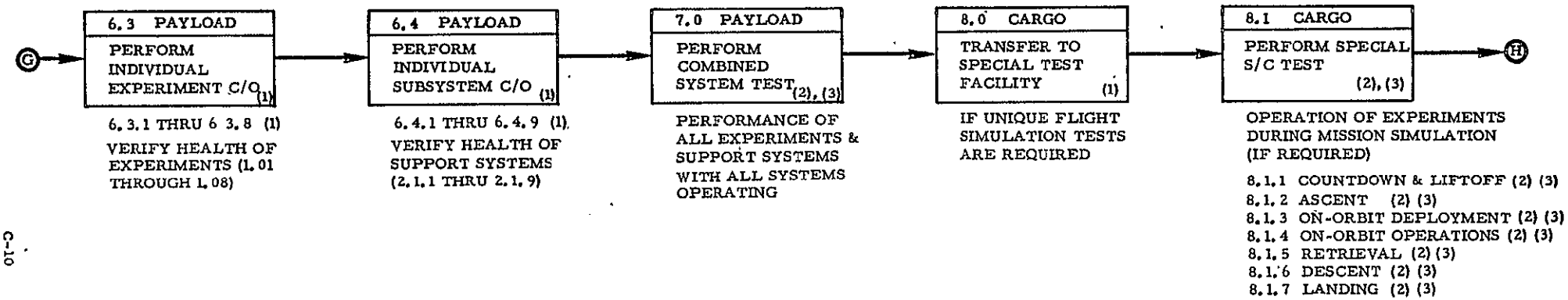
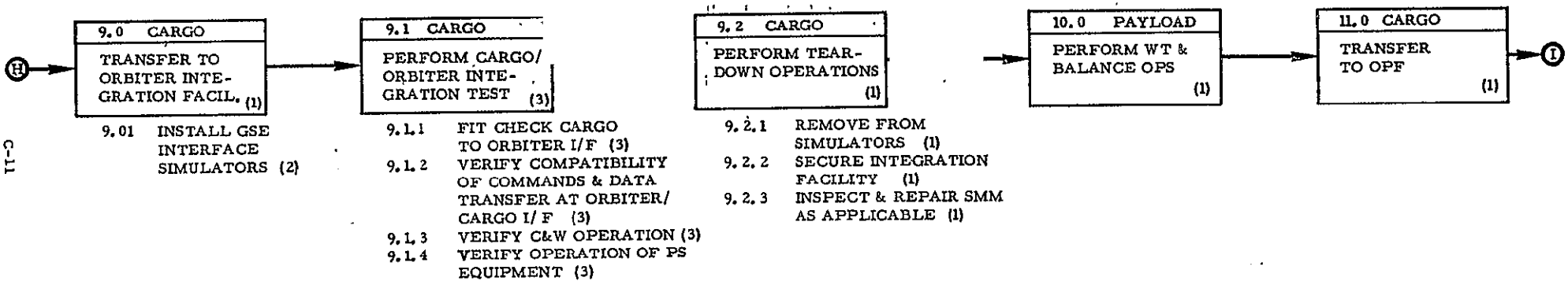



Figure C-1. Solar Maximum Mission FFBD (Cont)




* (1) ORBITER I/F KNOWLEDGE NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-1. Solar Maximum Mission FFBD (Cont)

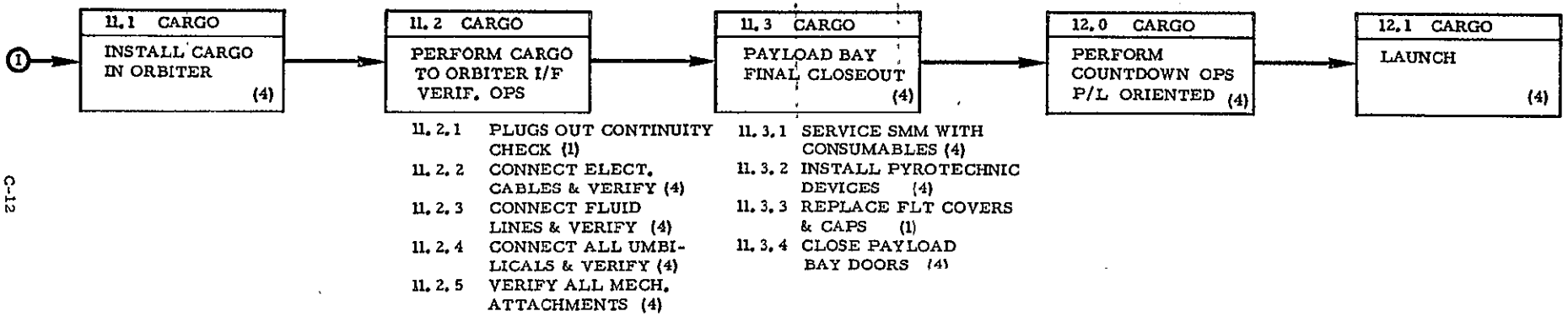



Figure C-1. Solar Maximum Mission FFBD (Cont)

Table C.1 SMM INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE C&M. | IVE | | |
| 1.0 | Develop & verify experiments | (2) | User | X | | | | | Various sources |
| 1.01 | UV magnetograph | (2) | | X | | | | | |
| 1.02 | Extreme UV spectrometer | (2) | | X | | | | | |
| 1.03 | High resolution X-Ray spectrometer | (2) | | X | | | | | |
| 1.04 | Hard X-Ray imaging | (2) | | X | | | | | |
| 1.05 | X-Ray polarimetry | (2) | | X | | | | | |
| 1.06 | Gamma ray detector | (2) | | X | | | | | |
| 1.07 | Hydrogen Alpha photometer | (2) | | X | | | | | |
| 1.08 | Flare finder | (2) | | X | | | | | |
| 1.1 | Experiment acceptance | (1) | | X | | | | | |
| 1.1.1 | UV magnetograph acceptance | (1) | | Y | | | | | |
| 1.1.2 | Extreme UV spectrometer acceptance | (1) | | X | | | | | |
| 1.1.3 | H R X R S acceptance | (1) | | X | | | | | |
| 1.1.4 | Hard X-Ray imaging acceptance | (1) | | X | | | | | |
| 1.1.5 | X-Ray polarimetry acceptance | (1) | | X | | | | | |
| 1.1.6 | Gamma ray detector acceptance | (1) | | X | | | | | |
| 1.1.7 | Hydrogen Alpha photometer acceptance | (1) | | Y | | | | | |
| 1.1.8 | Flare finder acceptance | (1) | | X | | | | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Table C.1 (Cont) SSM INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 1.2 | Electrical functional tests | (2) | User | X | | X | | | |
| 1.2.1 | UVM electrical functional tests | (2) | | X | | X | | | |
| 1.2.2 | EUVS electrical functional tests | (2) | | X | | X | | | |
| 1.2.3 | HHORS electrical functional tests | (2) | | X | | X | | | |
| 1.2.4 | HXRI electrical functional tests | (2) | | X | | X | | | |
| 1.2.5 | XRP electrical functional tests | (2) | | X | | X | | | |
| 1.2.6 | GRD electrical functional tests | (2) | | X | | X | | | |
| 1.2.7 | HAP electrical functional tests | (2) | | X | | X | | | |
| 1.2.8 | FF electrical functional tests | (2) | | X | | X | | | |
| 1.3 | Experiment environmental tests | (2) | | X | | | | | |
| 1.3.1 | Optical performance (vacuum) | (2) | | X | | | | X | |
| 1.3.2 | Thermal/Vac-thermal balance | (1) | | X | | | | X | |
| 1.3.3 | Vibration | (1) | | X | | | | X | |
| 1.4 | Fabricate experiment module structure | (2) | | X | | | | | |
| 1.4.1 | Fabricate electrical harnesses | (1) | | X | | X | | | ORB/P/L I/F harnesses included in SSM harnesses |
| 1.4.2 | Assemble structural subsystem | (1) | | X | | | | | |
| 1.5 | Assemble experiment module | (1) | | X | | | | | |
| 1.5.1 | Attachment | (1) | | X | | | | | |
| 1.5.2 | Optical alignement | (1) | | X | | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

Table C.1 (Cont) . SMM INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 1.6 | Experiment module compatibility test | (2) | User | X | | | | | |
| 1.6.1 | Functional | (2) | | X | X | X | X | | Trade study (risk, sched., cost) |
| 1.6.2 | Thermal/Vac | (1) | | X | | | | X | |
| 1.6.3 | Vibration | (1) | | X | | | | X | |
| 1.6.4 | Optical performance | (2) | | X | X | X | X | | Trade study (risk, sched., cost) |
| | | | | | | | | | |
| 2.0 | Develop & verify service system components | (1) | User | X | | | | | Various sources |
| 2.01 | Transponders | (1) | | X | | | | | |
| 2.02 | Processors | (1) | | X | | | | | |
| 2.03 | Antennas | (1) | | X | | | | | |
| 2.04 | Tape recorders | (1) | | X | | | | | |
| 2.05 | Decoders | (1) | | X | | | | | |
| 2.06 | Relays | (1) | | X | | | | | |
| 2.07 | Telemetry | (1) | | X | | | | | |
| 2.08 | Electronic logic circuits | (1) | | X | | | | | |
| 2.09 | Reaction wheels | (1) | | X | | | | | |
| 2.10 | Sun sensors | (1) | | X | | | | | |
| 2.11 | Solar panels | (1) | | X | | | | | |
| 2.12 | Batteries | (1) | | X | | | | | |

*(1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

Table C.1 (Cont) SMM INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 2.13 | Thermal blankets | (1) | User | X | | | | | Various sources |
| 2.14 | Cold gas tankage | (1) | | X | | | | | |
| 2.15 | Regulators | (1) | | X | | | | | |
| 2.16 | Valves | (1) | | X | | | | | |
| 2.17 | Electronic components | (1) | | X | | | | | |
| 2.18 | Deployment mechanisms | (1) | | X | | | | | |
| 2.19 | Miscellaneous equipment | (1) | | X | | | | | |
| 2.1 | Subsystem assembly | (2) | | X | | | | | |
| 2.1.1 | Power switching module | (2) | | X | | | | | |
| 2.1.2 | Thermistor instrumentation | (2) | | X | | | | | |
| 2.1.3 | Caution & warning | (2) | | X | | | | | |
| 2.1.4 | Communications & data handling module | (2) | | X | | | | | |
| 2.1.5 | Power module | (2) | | X | | | | | |
| 2.1.6 | Attitude control subsystem | (2) | | X | | | | | |
| 2.1.7 | Flight support c/o monitoring unit | (2) | | X | | | | | |
| 2.1.8 | Preflight disconnect | (2) | | X | | | | | |
| 2.1.9 | Electrical integration module | (2) | | X | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

*(1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION STIMULATED

(4) DIRECT ORBITER I/F

Table C.1 (Cont) SSM INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 2.2 | Subsystem acceptance | (1) | User | X | | | | | |
| 2.2.1 | Power switching module acceptance | (1) | | X | | | | | |
| 2.2.2 | Thermistor instrumentation acceptance | (1) | | X | | | | | |
| 2.2.3 | Caution & warning acceptance | (1) | | X | | | | | |
| 2.2.4 | C&DH module acceptance | (1) | | X | | | | | |
| 2.2.5 | Power Module acceptance | (1) | | X | | | | | |
| 2.2.6 | Attitude control subsystem acceptance | (1) | | X | | | | | |
| 2.2.7 | Flt support c/o monitoring unit acceptance | (1) | | X | | | | | |
| 2.2.8 | Preflight disconnect acceptance | (1) | | X | | | | | |
| 2.2.9 | Electrical integration module acceptance | (1) | | X | | | | | |
| 2.3 | Subsystem checkout | (2) | | X | | X | | | |
| 2.3.1 | Power switching module checkout | (2) | | X | | X | | | |
| 2.3.2 | Thermistor instrumentation checkout | (2) | | X | | X | | | |
| 2.3.3 | Caution & warning checkout | (2) | | X | | X | | | |
| 2.3.4 | C&DH module checkout | (2) | | X | | X | | | |
| 2.3.5 | Power module checkout | (2) | | X | | X | | | |
| 2.3.6 | Attitude control subsystem checkout | (2) | | X | | X | | | |
| 2.3.7 | Flt support c/o monitoring unit checkout | (2) | | X | | X | | | |
| 2.3.8 | Preflight disconnect checkout | (2) | | X | | X | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

**Table C.1 (Cont) SSM INTERFACE CHECKOUT MATRIX**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 2.3.9. | Electrical integration module checkout | (2) | User | X | | X | | | |
| 2.4 | Fabricate SSM structure | (2) | | X | | | | | |
| 2.4.1 | Fabricate electrical harnesses | (2) | | X | | X | | | ORB/P/L I/F knoledge for I/F Harnesses |
| 2.4.2 | Assemble structural subsystem | (1) | | X | | | | | |
| 2.5 | Assemble service system module | (1) | | X | | | | | |
| 2.6 | Software verification | (2) | | X | | X | | | Can be accomplished at remote locat |
| 2.6.1 | Checkout software | (2) | | X | | | | | |
| 2.6.2 | Applications software | (2) | | X | | | | | |
| 2.6.3 | Computers and processors | (2) | | X | | | | | |
| 2.6.4 | Test procedures | (2) | | X | | | | | |
| 2.7 | SSM functional test | (2) | | X | X | X | X | | To be accomplished at both sites |
| 2.7.1 | Power switching module checkout | (2) | | X | X | X | X | | |
| 2.7.2 | Thermistor instrumentation checkout | (2) | | X | X | X | X | | |
| 2.7.3 | Caution & warning checkout | (2) | | X | X | X | X | | |
| 2.7.4 | C&DH module checkout | (2) | | X | X | X | X | | |
| 2.7.5 | Power module checkout | (2) | | X | X | X | X | | |
| 2.7.6 | Attitude control system checkout | (2) | | X | X | X | X | | |
| 2.7.7 | Flt support c/o monitoring unit checkout | (2) | | X | X | X | X | | |
| 2.7.8 | Preflight disconnect checkout | (2) | | X | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.1 (Cont) SSM INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 2.7.9 | Electrical integration module checkout | (2) | User | X | X | X | X | | At either or both sites |
| 2.8 | Environmental test | (1) | | X | | X | | | |
| 2.8.1 | Vibration/acoustics | (1) | | X | | X | | X | |
| 2.8.2 | Thermal balance | (1) | | X | | X | | X | |
| | | | | | | | | | |
| 3.0 | Integration of subsystem modules | (2) | | X | X | X | X | | Trade study |
| 3.1 | EM/SSM electrical integration | (1) | | X | | | | | Connect cables-no power |
| 3.2 | EM/SSM electrical functional tests | (2) | | X | X | X | X | | Trade study |
| 3.3 | EM/SSM mechanical integration | (1) | | X | | | | | |
| 3.3.1 | Mechanically mate EM & SSM | (1) | | X | X | X | X | | Trade study |
| 3.3.2 | Connect modules electrically | (1) | | X | X | X | X | | |
| 3.4 | Perform EM/SSM interface verification tests | (2) | | X | X | X | X | | |
| 3.4.1 | Module to module continuity | (1) | | X | X | X | X | | |
| 3.4.2 | Bus isolation check | (1) | | X | X | X | X | | |
| 3.4.3 | Fitting leak check | (1) | | X | X | X | X | | |
| 3.4.4 | Repeat of electrical functional tests | (2) | | X | X | X | X | | At either or both sites |
| 3.4.5 | Mechanical fit check | (2) | | X | X | X | X | | |
| | | | | | | | | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

**Table C.1 (Cont) SMM INTERFACE CHECKOUT MATRIX**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 4.0 | Prepare to initiate payload operations | (2) | User | X | X | | | | |
| 4.01 | Test readiness briefings | (1) | | X | X | | | | |
| 4.02 | Review test procedures | (1) | | X | X | | | | Both sites |
| 4.03 | Review hardware documentation | (2) | | X | X | | | | |
| 4.04 | Review safety plans | (1) | | X | X | | | | |
| 4.05 | Review interface documentation | (2) | | X | X | | | | |
| 4.06 | Checkout & calibrate test equipment | (1) | | X | X | X | X | | |
| 4.1 | Perform SMM integrated system tests | (1), (2), (3) | | X | X | X | X | | |
| 4.1.1 | Functional & electrical performance | (2) | | X | X | X | X | | |
| 4.1.2 | EMC/RFI tests | (2) | | X | X | | | | Monitor EMI/RFI during funct. tests |
| 4.1.3 | Mass property determination | (1) | | X | | | | X | Special facility |
| 4.1.4 | Optical alignement | (2) | | X | X | X | X | | Both sites |
| 4.1.5 | Thermal/vac balance | (1) | | X | | X | | X | Special facility required |
| 4.1.6 | Antenna pattern | (2) | | X | X | X | X | | Both sites |
| 4.1.7 | STDN/TDRSS compatibility | (3) | | X | X | | | | Direct link communications |
| 4.1.8 | Fine pointing | (2) | | X | X | X | X | | Both sites |
| 4.1.9 | Vibration/shock/acoustics | (1) | | X | X | X | | X | Special facility required |
| 4.1.10 | Deployment | (2) | | X | X | X | X | | |
| 4.1.11 | Magnetics | (2) | | X | | X | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

Table C.1 (Cont) SMM INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 5.0 | Configure for flight | (1) | User | X | X | | | | Either site (trade study) |
| 5.01 | Inspect | (1) | | X | X | | | | |
| 5.02 | Refurbish | (1) | | X | X | | | | |
| 5.03 | Install solar panels & external equipment | (1) | | X | X | | | | |
| 5.1 | Closout, package & ship to launch site | (1) | | X | | | | | |
| 5.1.1 | Install access panels | (1) | | X | | | | | |
| 5.1.2 | Paint | (1) | | X | | | | | |
| 5.1.3 | Emissivity tests | (1) | | X | | | | | |
| 5.1.4 | Install in shipping container | (1) | | X | | | | | |
| 5.1.5 | Add environment monitoring sensors | (1) | | X | | | | | |
| 5.1.6 | Install shipping support equipment | (1) | | X | | | | | |
| 5.1.7 | Ship | (1) | | X | | | | | |
| | | | | | | | | | |
| 6.0 | SMM arrival at launch site | (1) | Launch St. | | X | | | | |
| 6.1 | Transfer to receiving facility | (1) | | | X | | | | |
| 6.2 | Perform receiving inspection operations | (1) | | | X | | | | |
| 6.3 | Perform individual experiment checkout | (1) | | | X | X | X | | Post shipping requirement |
| 6.3.1 | UV magnetograph checkout | (1) | | | X | X | X | | |
| 6.3.2 | Extreme UV spectrometer checkout | (1) | | | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS STIMULATED
(4) DIRECT ORBITER I/F

Table C.1 (Cont) SMM INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 6.3.3 | High resolution X-Ray spectrometer checkout | (1) | Launch Site | | X | X | X | | Post shipping requirement |
| 6.3.4 | Hard X-Ray imaging checkout | (1) | | | X | X | X | | |
| 6.3.5 | X-Ray polarimetry checkout | (1) | | | X | X | X | | |
| 6.3.6 | Gamma ray detector checkout | (1) | | | X | X | X | | |
| 6.3.7 | Hydrogen Alpha photometer checkout | (1) | | | X | X | X | | |
| 6.3.8 | Flare finder checkout | (1) | | | X | X | X | | |
| 6.4 | Perform individual subsystem checkout | (1) | | | X | X | X | | |
| 6.4.1 | Power switching module checkout | (1) | | | X | X | X | | |
| 6.4.2 | Thermistor instrumentation checkout | (1) | | | X | X | X | | |
| 6.4.3 | Caution & warning module checkout | (1) | | | X | X | X | | |
| 6.4.4 | C&DH module checkout | (1) | | | X | X | X | | |
| 6.4.5 | Power module checkout | (1) | | | X | X | X | | |
| 6.4.6 | Attitude control system checkout | (1) | | | X | X | X | | |
| 6.4.7 | Flt support c/o monitoring unit checkout | (1) | | | X | X | X | | |
| 6.4.8 | Preflight disconnect checkout | (1) | | | X | X | X | | |
| 6.4.9 | Electrical integration module checkout | (1) | | | X | X | X | | |
| | | | | | | | | | |
| 7.0 | Perform combined system test | (2), (3) | | X | X | X | X | | 7.0,8.1,&9.0 tests could be combined & tests conducted in IVE. Need trade study. |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.1 (Cont)' SMM' INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 8.0 | Transfer to special test facility | (1) | Launch Site | | X | X | X | | 7.0,8.1& 9.0 tests could be combined & tests conducted in IVE. Need trade study |
| 8.1 | Perform special S/C test | (2), (3) | | | X | X | X | | |
| 8.1.1 | Countdown and liftoff simulation | (2), (3) | | | X | X | X | | |
| 8.1.2 | Ascent simulation | (2), (3) | | | X | X | X | | |
| 8.1.3 | On orbit deployment simulation | (2), (3) | | | X | X | X | | |
| 8.1.4 | On orbit operations simulation | (2), (3) | | | X | X | X | | |
| 8.1.5 | Retrieval simulation | (2), (3) | | | X | X | X | | |
| 8.1.6 | Descent simulation | (2), (3) | | | X | X | X | | |
| 8.1.7 | Landing simulation | (2), (3) | | | X | X | X | | |
| | | | | | | | | | |
| 9.0 | Transfer to orbiter integration facility | (1) | | | X | | | | Q & C (MSOB) |
| 9.01 | Install GSE interface simulators | (2) | | X | X | X | X | | Orbiter simulator required |
| 9.1 | Perform cargo/orbiter integration test | (3) | | X | X | X | X | | 7.0,8.1,&9.0 tests could be combined & tests conducted in IVE. Need trade study for cost effectiveness |
| 9.1.1 | Fit check cargo to orbiter interface | (3) | | X | X | X | X | | |
| 9.1.2 | Verify compatibility of command & data X-fer at orbiter/cargo interface | (3) | | X | X | X | X | | |
| 9.1.3 | Verify caution & warning operation | (3) | | X | X | X | X | | |
| 9.1.4 | Verify operation of PS equipment | (3) | | X | X | X | X | | User site could be used if Orbiter Simulator is available |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

Table C.1 (Cont) SMM INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 9.2 | Perform tear down operations | (1) | Launch Site | X | X | X | X | | User site could be used if orbiter simulator is available |
| 9.2.1 | Remove from simulators | (1) | | X | X | X | X | | |
| 9.2.2 | Secure integration facility | (1) | | X | X | X | X | | |
| 9.2.3 | Inspect & repair SMM, as applicable | (1) | | X | X | X | X | | |
| | | | | | | | | | |
| 10.0 | Perform weight & balance operations | (1) | | X | X | | | X | Specialized facility required |
| | | | | | | | | | |
| 11.0 | Transfer to OPF | (1) | | | X | | | | |
| 11.1 | Install cargo in orbiter | (4) | | | X | | | | |
| 11.2 | Perform cargo to orbiter I/F verification ops. | (4) | | | X | | | | |
| 11.2.1 | Plugs out continuity check | (1) | | | X | | | | |
| 11.2.2 | Connect electrical cables & verify | (4) | | | X | | | | |
| 11.2.3 | Connect fluid lines & verify | (4) | | | X | | | | |
| 11.2.4 | Connect all umbilicals & verify | (4) | | | X | | | | |
| 11.2.5 | Verify all mechanical attachments | (4) | | | X | | | | |
| 11.3 | Payload bay final closeout | (4) | | | X | | | | |
| 11.3.1 | Service SMM with consumeables | (4) | | | X | | | | |
| 11.3.2 | Install pyrotechnic devices | (4) | | | X | | | | |
| 11.3.3 | Replace flight covers & caps | (4) | | | X | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.1 (Cont.)

| BLOCK NO. | DESCRIPTION | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 11.3.4 | Close payload bay doors | (4) | Launch Site | | X | | | | |
| | | | | | | | | | |
| 12.0 | Countdown operations | (4) | | | X | | | | |
| 12.1 | Launch | (4) | | | X | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

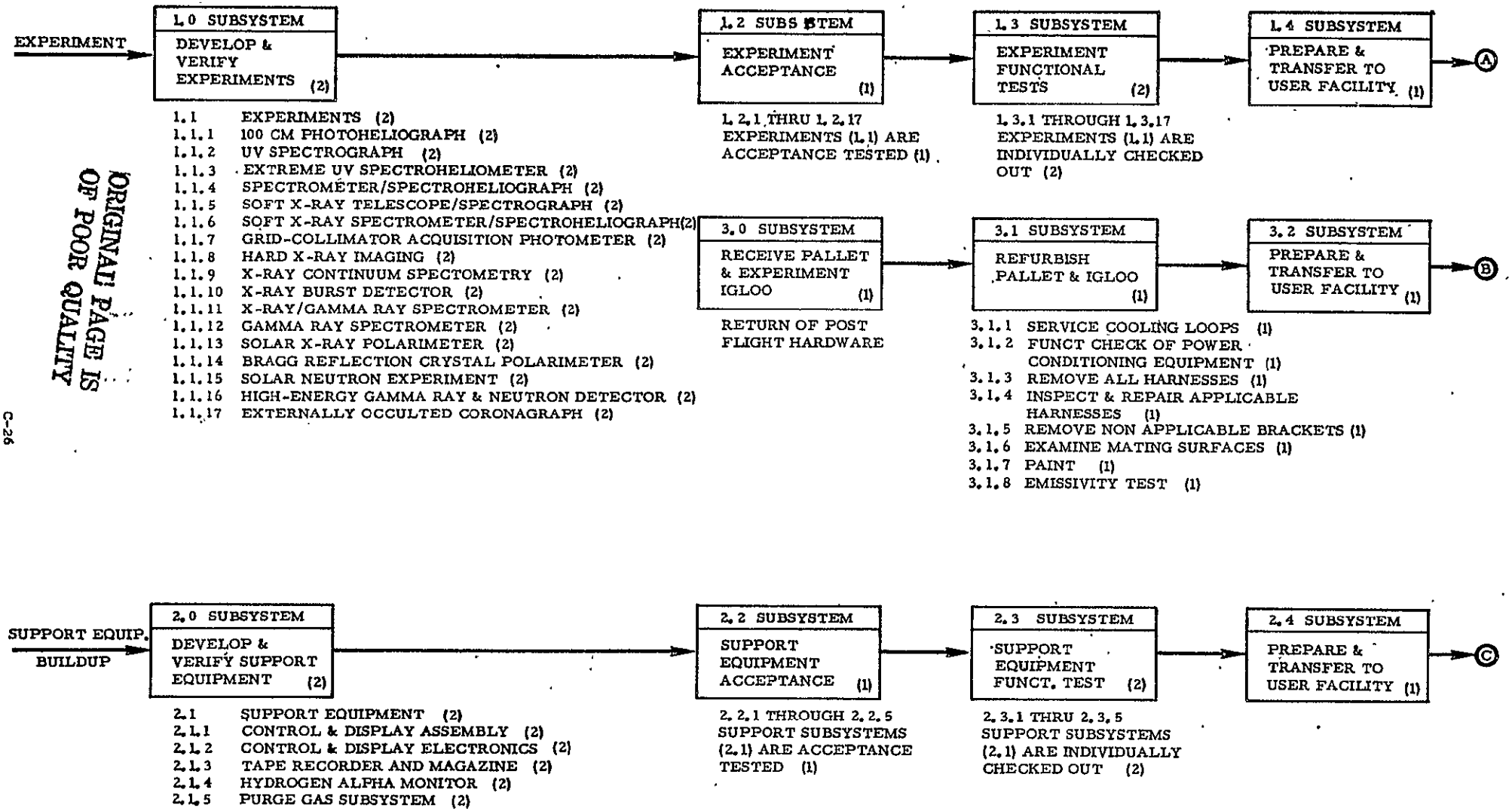



Figure C-2 Solar Physics Dedicated Mission FFBD

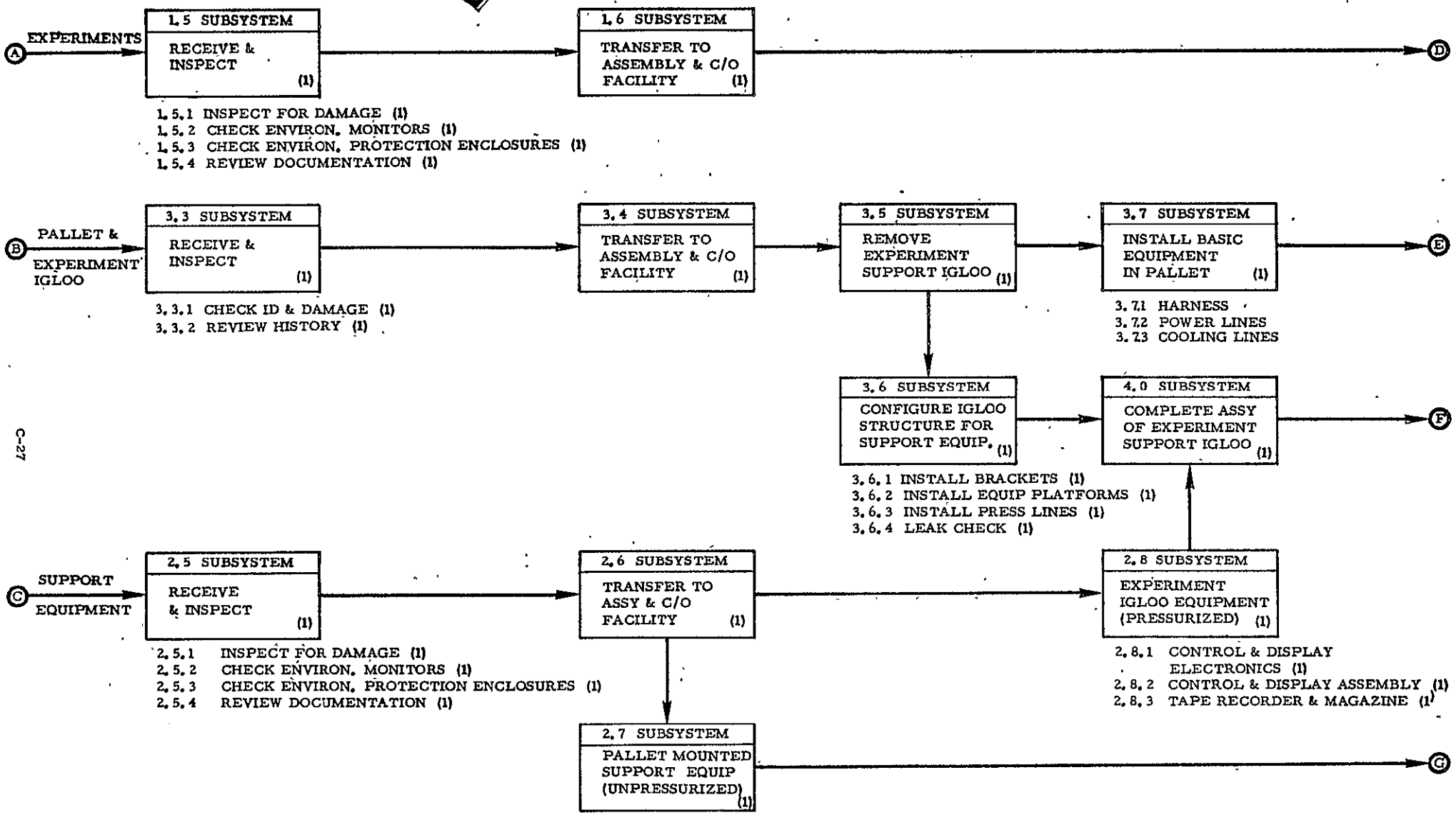



Figure C-2 Solar Physics Dedicated Mission FFBD (Cont)

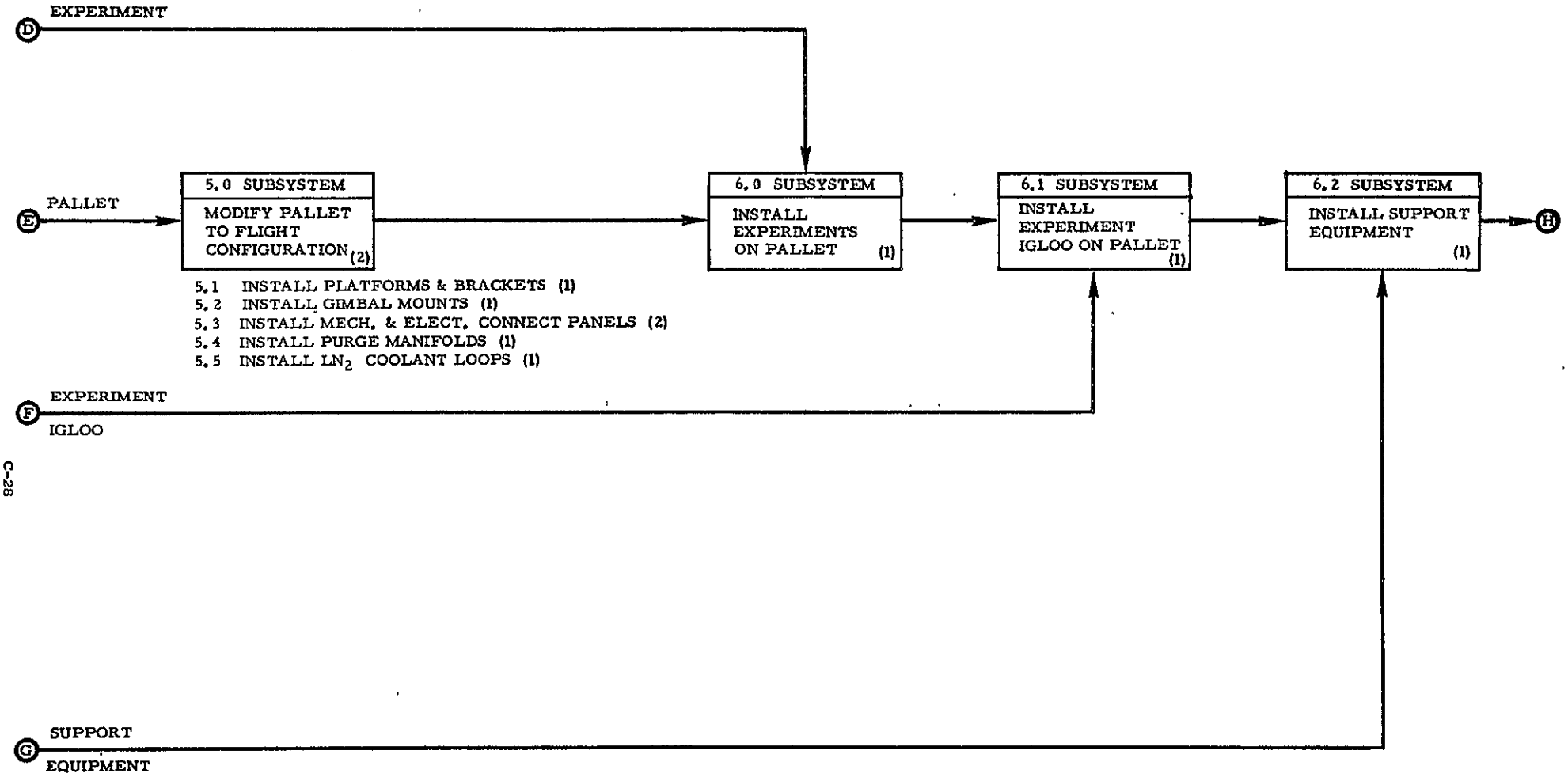





Figure C-2 Solar Physics Dedicated Mission FFBD (Cont)

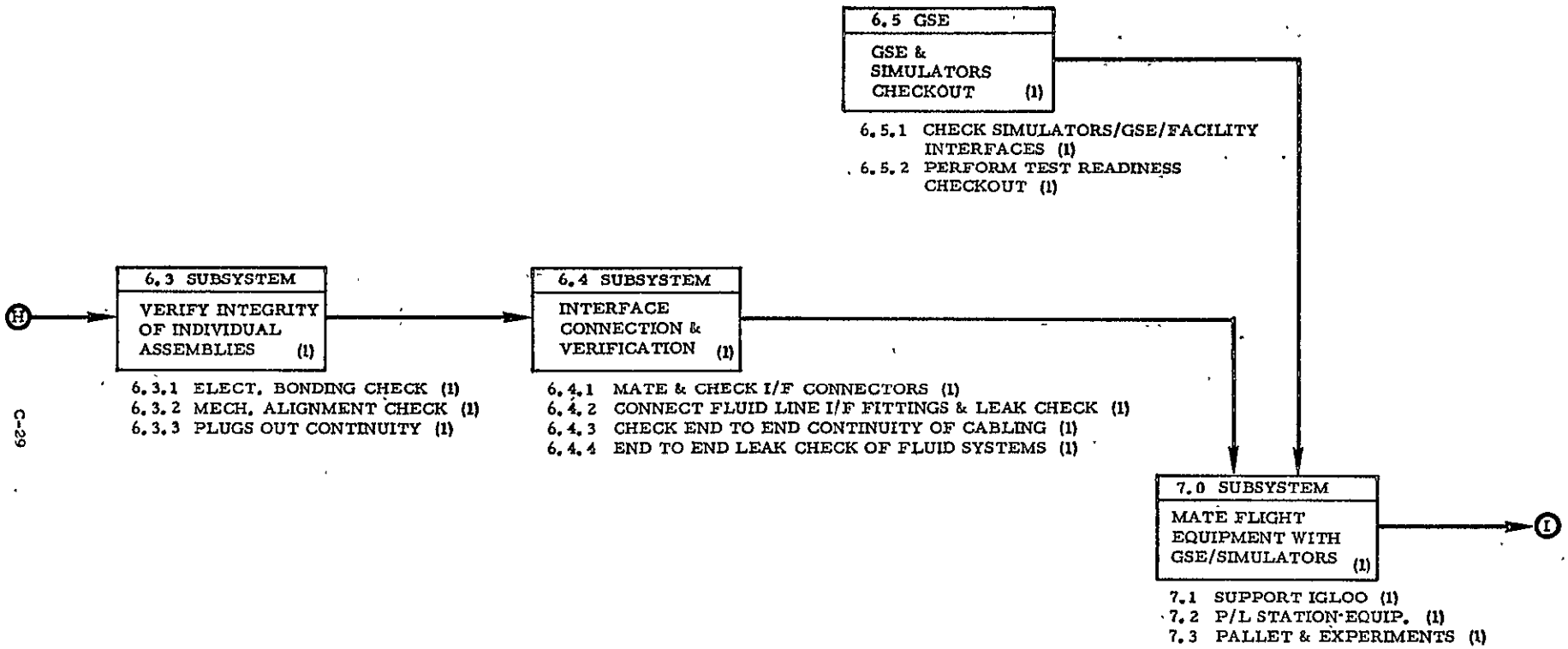





Figure C-2 Solar Physics Dedicated Mission FFBD (Cont)

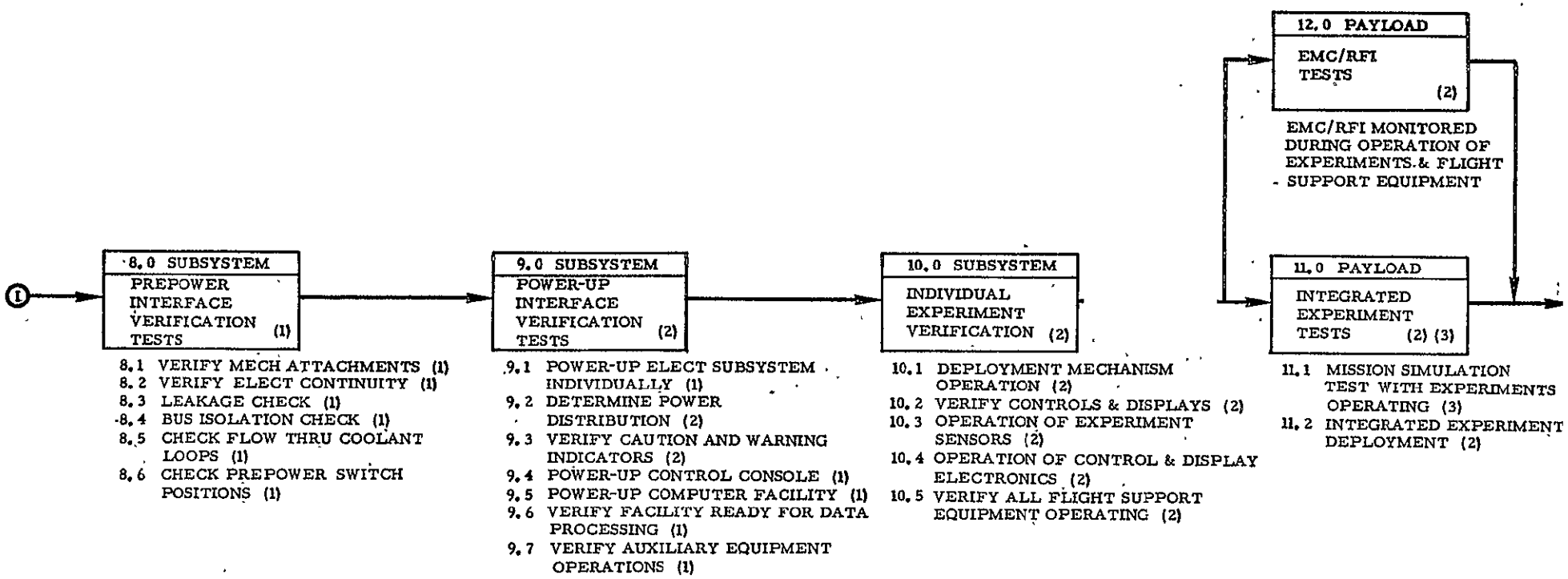



Figure C-2 Solar Physics Dedicated Mission FFBD (Cont)

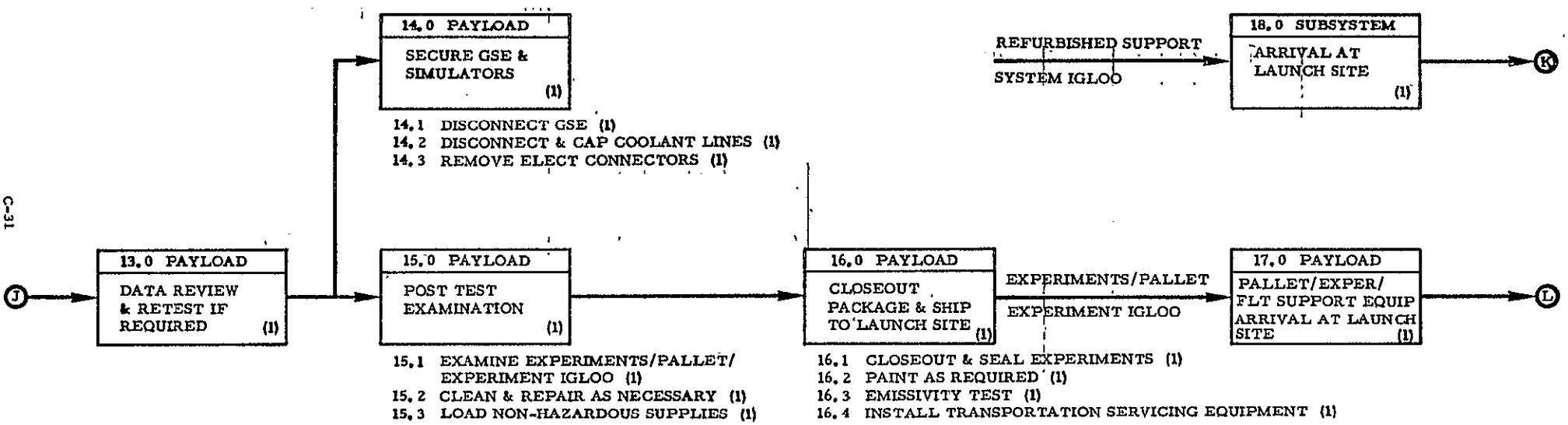



Figure C-2 Solar Physics Dedicated Mission FFBD (Cont)

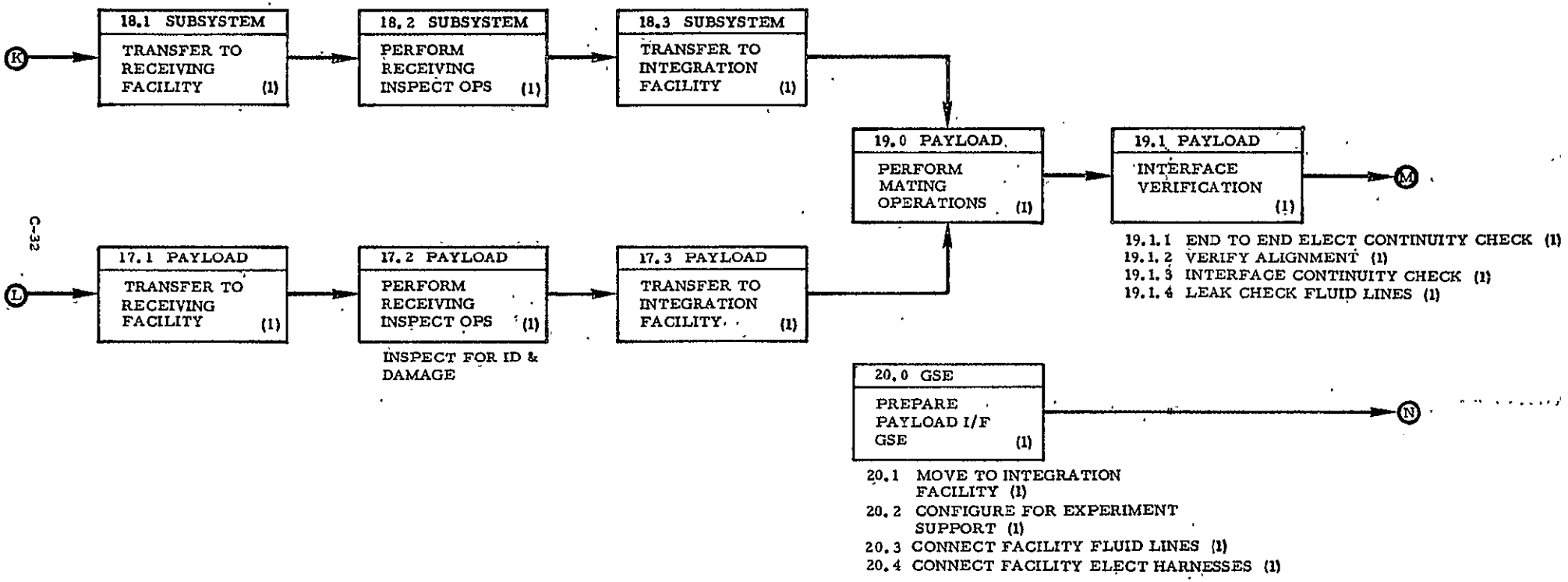
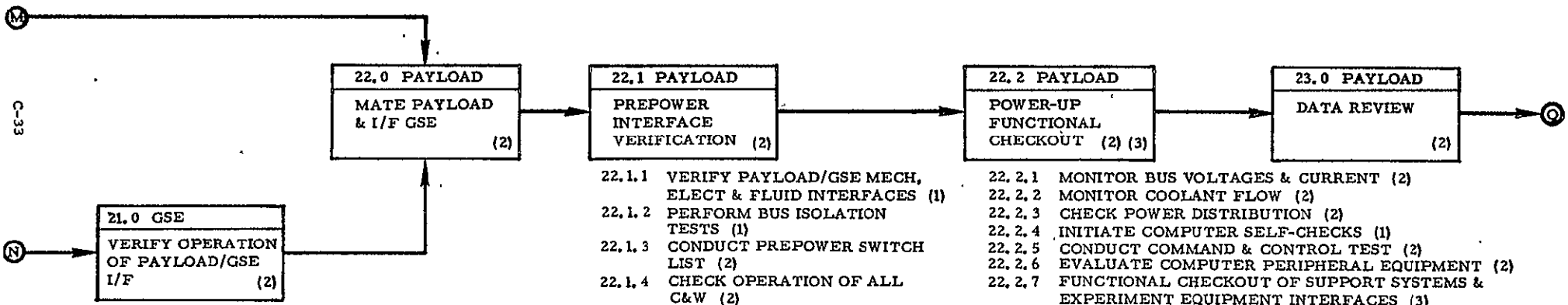





Figure C-2 Solar Physics Dedicated Mission FFBD (Cont)

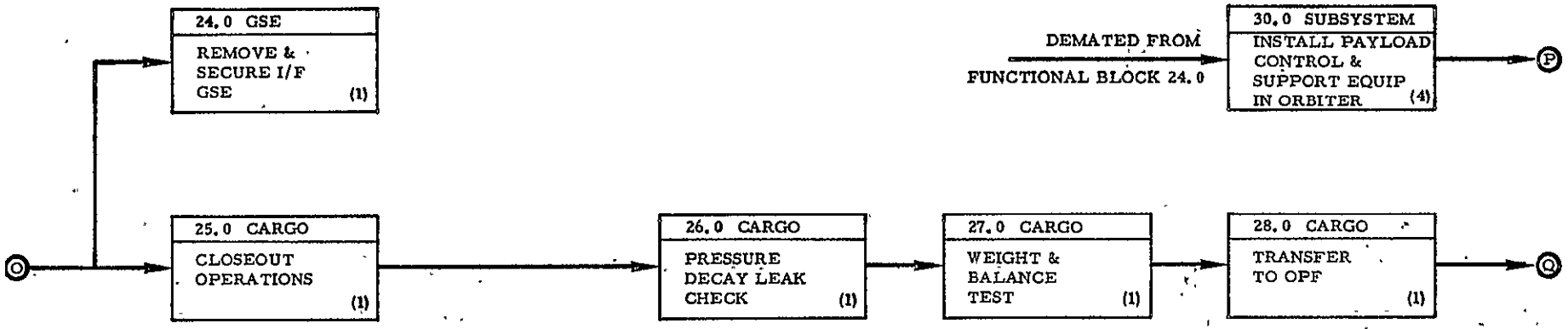



21.1 FUEL CELL/POWER DISTRIBUTION SIMULATION
21.2 ORBITER SIGNAL SIMULATION (2)
21.3 PAYLOAD SPECIALIST STATION EQUIPMENT OPERATIONS (2)
21.4 VERIFY UMBILICAL INTERFACES
21.5 VERIFY OPERATION OF DATA MANAGEMENT SUBSYSTEMS (2)
21.6 VERIFY OPERATION OF COMPUTER PERIPHERAL EQUIPMENT (1)
21.7 VERIFY OPERATION OF OPERATOR CONSOLE (1)

22.1.1 VERIFY PAYLOAD/GSE MECH, ELECT & FLUID INTERFACES (1)
22.1.2 PERFORM BUS ISOLATION TESTS (1)
22.1.3 CONDUCT PREPOWER SWITCH LIST (2)
22.1.4 CHECK OPERATION OF ALL C&W (2)

22.2.1 MONITOR BUS VOLTAGES & CURRENT (2)
22.2.2 MONITOR COOLANT FLOW (2)
22.2.3 CHECK POWER DISTRIBUTION (2)
22.2.4 INITIATE COMPUTER SELF-CHECKS (1)
22.2.5 CONDUCT COMMAND & CONTROL TEST (2)
22.2.6 EVALUATE COMPUTER PERIPHERAL EQUIPMENT (2)
22.2.7 FUNCTIONAL CHECKOUT OF SUPPORT SYSTEMS & EXPERIMENT EQUIPMENT INTERFACES (3)
22.2.8 EVALUATE MANUAL EMERGENCY BACKUP MODES (3)

Figure C-2 Solar Physics Dedicated Mission FFBD (Cont)




25.1 LOAD NON-HAZARDOUS SUPPLIES (1)
25.2 INSTALL ACCESS PANELS & COVER PLATES (1)
25.3 TOUCH UP PAINT (1)
25.4 EMISSIVITY TEST (1)



Figure C-2 Solar Physics Dedicated Mission FFBD (Cont)

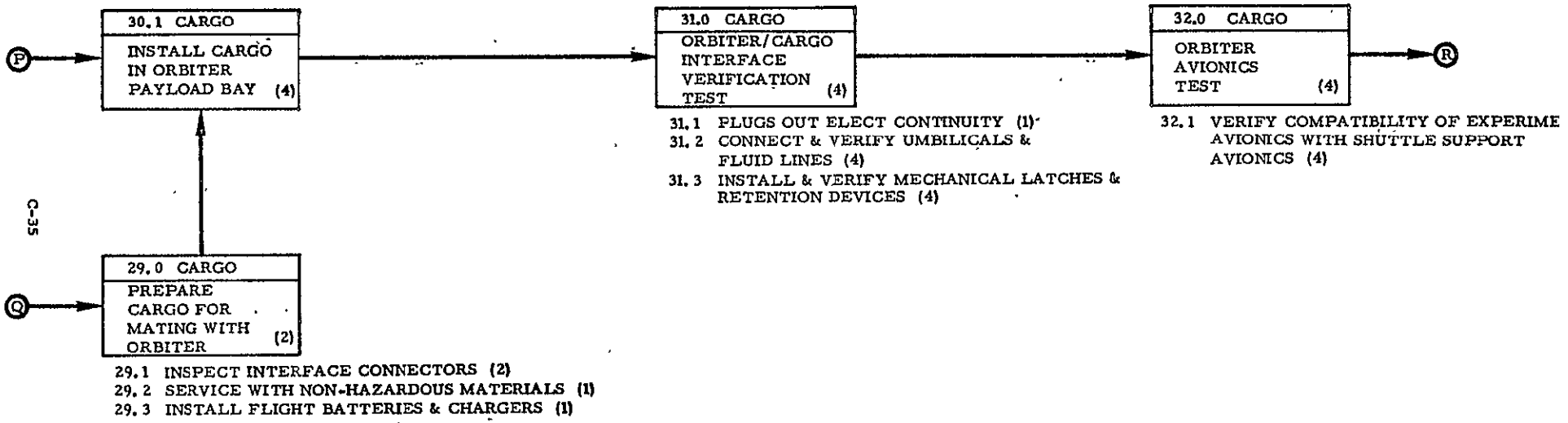





Figure C-2 Solar Physics Dedicated Mission FFBD (Cont)

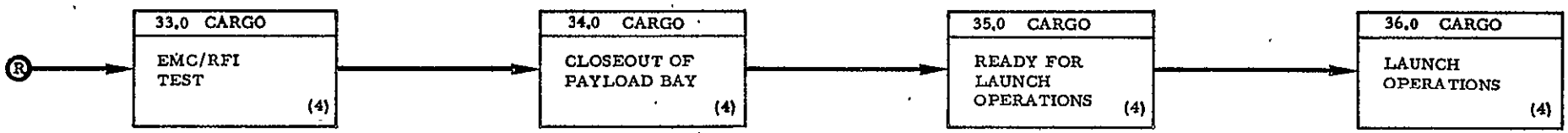



Figure C-2 Solar Physics Dedicated Mission FFBD (Cont)

Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 1.0 | Develop & verify experiments | (2) | User | X | | | | | Various sources |
| 1.1 | Experiments | (2) | | X | | | | | |
| 1.1.1 | 100 cm photoheliograph | (2) | | X | | | | | |
| 1.1.2 | UV spectrograph | (2) | | X | | | | | |
| 1.1.3 | Extreme UV spectro heliometer | (2) | | X | | | | | |
| 1.1.4 | Spectrometer/spectro heliograph | (2) | | X | | | | | |
| 1.1.5 | Soft X-Ray telescope/spectrograph | (2) | | X | | | | | |
| 1.1.6 | Soft X-Ray spectrometer/spectro heliograph | (2) | | X | | | | | |
| 1.1.7 | Grid collimator acquisition photometer | (2) | | X | | | | | |
| 1.1.8 | Hard X-Ray imaging | (2) | | X | | | | | |
| 1.1.9 | X-Ray continuum spectrometry | (2) | | X | | | | | |
| 1.1.10 | X-Ray burst detector | (2) | | X | | | | | |
| 1.1.11 | X-Ray/gamma ray spectrometer | (2) | | X | | | | | |
| 1.1.12 | Gamma ray spectrometer | (2) | | X | | | | | |
| 1.1.13 | Solar X-Ray polarimeter | (2) | | X | | | | | |
| 1.1.14 | Bragg reflection crystal polarimeter | (2) | | X | | | | | |
| 1.1.15 | Solar neutron experiment | (2) | | X | | | | | |
| 1.1.16 | High energy gamma ray & neutron detector | (2) | | X | | | | | |
| 1.1.17 | Externally occulted coronagraph | (2) | | X | | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

**Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 1.2 | Experiment acceptance | (1) | User | X | | | | | |
| 1.2.1 through 1.2.17 | experiments, same as in (1.1) are acceptance tested | (1) | | X | | | | | |
| 1.3 | Experiment functional tests | (2) | | X | | | | | |
| 1.3.1 through 1.3.17 | experiments, same as in (1.1) are individually checked out | (2) | | X | | X | | | |
| 1.4 | Prepare & transfer to User facility | (1) | | X | | | | | |
| 1.5 | Receive & inspect | (1) | | X | | | | | |
| 1.5.1 | Inspect for damage | (1) | | X | | | | | |
| 1.5.2 | Check environmental monitors | (1) | | X | | | | | |
| 1.5.3 | Check environmental protection enclosures | (1) | | X | | | | | |
| 1.5.4 | Review documentation | (1) | | X | | | | | |
| 1.6 | Transfer to assembly & checkout facility | (1) | | X | | | | | |
| | | | | | | | | | |
| 2.0 | Develop & verify support equipment | (2) | | X | | | | | |
| 2.1 | Support equipment | (2) | | X | | | | | |
| 2.1.1 | Control & display assembly | (2) | | X | | | | | |
| 2.1.2 | Control & display electronics | (2) | | X | | | | | |
| 2.1.3 | Tape recorder & magazine | (2) | | X | | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 2.1.4 | Hydrogen Alpha monitor | (2) | User | X | | | | | |
| 2.1.5 | Purge gas subsystem | (2) | | X | | | | | |
| 2.2 | Support equipment acceptance | (1) | | X | | | | | |
| 2.2.1 through | 2.2.5 support subsystems, same as in (2.1) | (1) | | X | | | | | |
| | are acceptance tested | | | | | | | | |
| 2.3 | Support equipment functional test | (2) | | X | | X | | | |
| 2.3.1 through | 2.3.5 support subsystems, same as in (2.1) | (2) | | X | | X | | | |
| | are individually checked out | | | | | | | | |
| 2.4 | Prepare and transfer to User facility | (1) | | X | | | | | |
| 2.5 | Receive & inspect | (1) | | X | | | | | |
| 2.5.1 | Inspect for damage | (1) | | X | | | | | |
| 2.5.2 | Check environmental monitors | (1) | | X | | | | | |
| 2.5.3 | Check environmental protection enclosures | (1) | | X | | | | | |
| 2.5.4 | Review documentation | (1) | | X | | | | | |
| 2.6 | Transfer to assembly and checkout facility | (1) | | X | | | | | |
| 2.7 | Pallet mounted support equipment(unpressurized | (1) | | X | | | | | |
| 2.7.1 | Hydrogen Alpha monitor | (1) | | X | | | | | |
| 2.7.2 | Purge gas subsystem | (1) | | X | | | | | |
| 2.7.3 | Payload station equipment | (1) | | X | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

**Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 2.8 | Experiment igloo equipment (pressurized) | (1) | User | X | | | | | |
| 2.8.1 | Control & display electronics | (1) | | X | | | | | |
| 2.8.2 | Control & display assembly | (1) | | X | | | | | |
| 2.8.3 | Tape recorder and magazine | (1) | | X | | | | | |
| | | | | | | | | | |
| 3.0 | Receive pallet & experiment igloo | (1) | | X | | | | | |
| | (return of post flight hardware) | | | | | | | | |
| 3.1 | Refurbish pallet & igloo | (1) | | X | | | | | |
| 3.1.1 | Service cooling loops | (1) | | X | | | | | |
| 3.1.2 | Functional check of power conditioning equip. | (1) | | X | | | | | |
| 3.1.3 | Remove all harnesses | (1) | | X | | | | | |
| 3.1.4 | Inspect & repair applicable harnesses | (1) | | X | | | | | |
| 3.1.5 | Remove non applicable brackets | (1) | | X | | | | | |
| 3.1.6 | Examine mating surfaces | (1) | | X | | | | | |
| 3.1.7 | Paint | (1) | | X | | | | | |
| 3.1.8 | Emissivity test | (1) | | X | | | | | |
| 3.2 | Prepare & transfer to User facility | (1) | | X | | | | | |
| 3.3 | Receive & inspect | (1) | | X | | | | | |
| 3.3.1 | Check ID & damage | (1) | | X | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 3.3.2 | Review history | (1) | User | X | | | | | |
| 3.4 | Transfer to assembly & checkout facility | (1) | | X | | | | | |
| 3.5 | Remove experiment support igloo | (1) | | X | | | | | |
| 3.6 | Configure igloo structure for support equip. | (1) | | X | | | | | |
| 3.6.1 | Install brackets | (1) | | X | | | | | |
| 3.6.2 | Install equipment platforms | (1) | | X | | | | | |
| 3.6.3 | Install pressure lines | (1) | | X | | | | | |
| 3.6.4 | Leak check | (1) | | X | | | | | |
| 3.7 | Install basic equipment in pallet | (1) | | X | | | | | |
| 3.7.1 | Harnesses | (1) | | X | | | | | |
| 3.7.2 | Purge lines | (1) | | X | | | | | |
| 3.7.3 | Cooling lines | (1) | | X | | | | | |
| | | | | | | | | | |
| 4.0 | Complete assembly of experiment support igloo | (1) | | X | | | | | |
| | | | | | | | | | |
| 5.0 | Modify pallet to flight configuration | (2) | | X | | | | | |
| 5.1 | Install platforms and brackets | (1) | | X | | | | | |
| 5.2 | Install gimbal mounts | (1) | | X | | | | | |
| 5.3 | Install mech. & electr. connect panels | (2) | | X | | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

**Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 5.4 | Install purge manifolds | (1) | User | X | | | | | |
| 5.5 | Install LN2 coolant loops | (1) | ↓ | X | | | | | |
| | — | | | | | | | | |
| 6.0 | Install experiments on pallet | (1) | | X | | | | | |
| 6.1 | Install experiment igloo on pallet | (1) | | X | | | | | |
| 6.2 | Install support equipment | (1) | | X | | | | | |
| 6.3 | Verify integrity of individual assemblies | (1) | | X | | | | | |
| 6.3.1 | Electrical bonding check | (1) | | X | | | | | |
| 6.3.2 | Mechanical alignment check | (1) | | X | | | | | |
| 6.3.3 | Plugs out continuity | (1) | | X | | | | | |
| 6.4 | Interface connection & verification | (1) | | X | | | | | |
| 6.4.1 | Mate & check interface connectors | (1) | | X | | | | | |
| 6.4.2 | Connect fluid line I/F fittings & leak check | (1) | | X | | | | | |
| 6.4.3 | Check end to end continuity of cabling | (1) | | X | | | | | |
| 6.4.4 | End to end leak check of fluid systems | (1) | | X | | | | | |
| 6.5 | GSE & simulators checkout | (1) | | X | X | X | X | | Trade study |
| 6.5.1 | Check simulators/GSE/facility interfaces | (1) | | X | X | X | X | | ↓ |
| 6.5.2 | Perform test readiness checkout | (1) | ↓ | X | X | X | X | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 7.0 | Mate flight equipment with GSE/simulators | (1) | User | X | X | X | X | | Trade study |
| 7.1 | Support igloo | (1) | | X | X | X | X | | |
| 7.2 | Payload station equipment | (1) | | X | X | X | X | | |
| 7.3 | Pallet & experiments | (1) | | X | X | X | X | | |
| | | | | | | | | | |
| 8.0 | Pre-power interface verification tests | (1) | | X | X | X | X | | |
| 8.1 | Verify mechanical attachments | (1) | | X | X | X | | | |
| 8.2 | Verify electrical continuity | (1) | | X | X | X | X | | |
| 8.3 | Leakage check | (1) | | X | X | X | | | |
| 8.4 | Bus isolation check | (1) | | X | X | X | | | |
| 8.5 | Check flow through coolant loops | (1) | | X | X | X | X | | |
| 8.6 | Check pre-power switch positions | (1) | | X | X | X | X | | |
| | | | | | | | | | |
| 9.0 | Power-up interface verification tests | (2) | | X | X | X | X | | |
| 9.1 | Power-up elect. subsystems individually | (1) | | X | X | X | X | | |
| 9.2 | Determine power distribution | (2) | | X | X | X | X | | |
| 9.3 | Verify Caution & warning indicators | (2) | | X | X | X | X | | |
| 9.4 | Power-up control console | (1) | | X | X | X | X | | |
| 9.5 | Power-up computer facility | (1) | | X | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

**Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 9.6 | Verify facility ready for data processing | (1) | User | X | X | X | X | | Trade study |
| 9.7 | Verify auxiliary equipment operating | (1) | | X | X | X | X | | |
| | | | | | | | | | |
| 10.0 | Individual experiment verification | (2) | | X | X | X | X | | |
| 10.1 | Deployment mechanism operation | (2) | | X | X | X | | | |
| 10.2 | Verify controls & displays | (2) | | X | X | X | X | | Trade study |
| 10.3 | Operation of experiment sensors | (2) | | X | X | X | X | | |
| 10.4 | Operation of control & display electronics | (2) | | X | X | X | X | | |
| 10.5 | Verify all flt support equipment operating | (2) | | X | X | X | X | | |
| | | | | | | | | | |
| 11.0 | Integrated experiment tests | (2),(3) | | X | X | X | X | | Both sites; trade study |
| 11.1 | Mission sim. test with experiments operating | (3) | | X | X | X | X | | |
| 11.2 | Integrated experiment deployment | (2) | | X | X | X | X | | |
| | | | | | | | | | |
| 12.0 | EMC/RFI tests (EMC/RFI monitored during operation of experiments & flight support equipment) | (2) | | X | X | X | X | | |
| | | | | | | | | | |
| 13.0 | Data review & retest, if required | (1) | | X | X | X | X | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS STIMULATED

(4) DIRECT ORBITER I/F

Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 14.0 | Secure GSE & simulators | (1) | User | X | X | X | X | | Either site |
| 14.1 | Disconnect GSE | (1) | | X | X | X | X | | |
| 14.2 | Disconnect & cap coolant lines | (1) | | X | X | X | X | | |
| 14.3 | Remove electrical connectors | (1) | | X | X | X | X | | |
| | | | | | | | | | |
| 15.0 | Post-test examination | (1) | | X | X | | | | |
| 15.1 | Examine experiments/pallet/experiment igloo | (1) | | X | X | | | | |
| 15.2 | Clean & repair, as necessary | (1) | | X | X | | | | |
| 15.3 | Load non-hazardous supplies | (1) | | X | X | | | | |
| | | | | | | | | | |
| 16.0 | Closeout, package & ship to Launch Site | (1) | | X | | | | | |
| 16.1 | Closeout & seal experiments | (1) | | X | | | | | |
| 16.2 | Paint as required | (1) | | X | | | | | |
| 16.3 | Emissivity test | (1) | | X | | | | | |
| 16.4 | Install transportation servicing equipment | (1) | | X | | | | | |
| | | | | | | | | | |
| 17.0 | Pallet/exper./flt. support equip. arr. @LS | (1) | Launch site | | X | | | | |
| 17.1 | Transfer to receiving facility | (1) | | | X | | | | |
| 17.2 | Perform receiving inspection operations | (1) | | | X | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

**Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITF ORIENTED | GSE SIM. | IVE | | |
| 17.3 | Transfer to integration facility | (1) | Launch site | X | X | | | | |
| | | | | | | | | | |
| 18.0 | Refurbished support system igloo arrival | (1) | | | X | | | | |
| | at Launch Site | | | | | | | | |
| 18.1 | Transfer to receiving facility | (1) | | | X | | | | |
| 18.2 | Perform receiving inspection operations | (1) | | | X | | | | |
| 18.3 | Transfer to integration facility | (1) | | | X | | | | |
| | | | | | | | | | |
| 19.0 | Perform mating operations | (1) | | | X | | | | |
| 19.1 | Interface verification | (1) | | | X | X | | | |
| 19.1.1 | End to end electrical continuity check | (1) | | | X | X | X | | |
| 19.1.2 | Verify alignment | (1) | | | X | X | | | |
| 19.1.3 | Interface continuity check | (1) | | | X | X | | | |
| 19.1.4 | Leak check fluid lines | (1) | | | X | X | | | |
| | | | | | | | | | |
| 20.0 | Prepare payload interface GSE | (1) | | X | X | X | X | | Either site |
| 20.1 | Move to integration facility | (1) | | X | X | X | X | | |
| 20.2 | Configure for experiment support | (1) | | X | X | X | X | | |
| 20.3 | Connect facility fluid lines | (1) | | X | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 20.4 | Connect facility electrical harness | (1) | Launch site | X | X | X | X | | Either site |
| 21.0 | Verify operation of payload/GSE interface | (2) | | X | X | X | X | | |
| 21.1 | Fuel cell/power distribution simulation | (2) | | X | X | X | X | | |
| 21.2 | Orbiter signal simulation | (2) | | X | X | X | X | | |
| 21.3 | Payload specialist station equipment operation | (2) | | X | X | X | X | | |
| 21.4 | Verify umbilical interfaces | (2) | | X | X | X | X | | |
| 21.5 | Verify oper. of data management subsystems | (2) | | X | X | X | X | | |
| 21.6 | Verify oper. of computer periph. equipment | (1) | | X | X | X | X | | |
| 21.7 | Verify operation of operator console | (1) | | X | X | X | X | | |
| 22.0 | Mate payload & interface GSE | (2) | | X | X | X | X | | Either site; trade study |
| 22.1 | Pre-power interface verification | (2) | | X | X | X | X | | |
| 22.1.1 | Verify payload/GSE mech., elect. & fluid I/F | (1) | | X | X | | | | |
| 22.1.2 | Perform bus isolation tests | (1) | | X | X | X | X | | |
| 22.1.3 | Conduct pre-power switch list | (2) | | X | X | X | X | | |
| 22.1.4 | Check operation of all caution & warning | (2) | | X | X | X | X | | |
| 22.2 | Power-up functional checkout | (2),(3) | | X | X | X | X | | |
| 22.2.1 | Monitor bus voltages & current | (2) | | X | X | X | X | | |
| 22.2.2 | Monitor coolant flow | (2) | | X | X | X | X | | |
| 22.2.3 | Check power distribution | (2) | | X | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 22.2.4 | Initiate computer self-checks | (1) | Launch site | X | X | X | X | | Either site; trade study |
| 22.2.5 | Conduct command & control test | (2) | | X | X | X | X | | |
| 22.2.6 | Evaluate computer peripheral equipment | (2) | | X | X | X | X | | |
| 22.2.7 | Functional c/o of support systems and experiment equipment interfaces | (3) | | X | X | X | X | | |
| 22.2.8 | Evaluate manual emergency backup modes | (3) | | X | X | X | X | | |
| 23.0 | Data review | (2) | | X | X | | | | Trade study, see 22.2 |
| 24.0 | Remove and secure interface GSE | (1) | | X | X | X | X | | |
| 25.0 | Close-out operations | (1) | | | X | | | | |
| 25.1 | Load non-hazardous supplies | (1) | | | X | | | | |
| 25.2 | Install access panels & cover plates | (1) | | | X | | | | |
| 25.3 | Touch-up paint | (1) | | | X | | | | |
| 25.4 | Emissivity test | (1) | | | X | | | | |
| 26.0 | Pressure decay leak check | (1) | | | X | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 27.0 | Weight & balance test | (1) | Launch site | | X | | | X | |
| | | | | | | | | | |
| 28.0 | Transfer to OPF | (1) | | | X | | | | |
| | | | | | | | | | |
| 29.0 | Prepare cargo for mating with orbiter | (2) | | | X | | | | |
| 29.1 | Inspect interface connectors | (2) | | | X | | | | |
| 29.2 | Service with non-hazardous materials | (1) | | | X | | | | |
| 29.3 | Install flight batteries and chargers | (1) | | | X | | | | |
| | | | | | | | | | |
| 30.0 | Install payload control & support equip. in Orb. | (4) | | | X | | | | |
| 30.1 | Install cargo in orbiter payload bay | (4) | | | X | | | | |
| | | | | | | | | | |
| 31.0 | Orbiter/cargo interface verification test | (4) | | | X | | | | |
| 31.1 | Plugs out electrical continuity | (1) | | | X | | | | |
| 31.2 | Connect & verify umbilicals & fluid lines | (4) | | | X | | | | |
| 31.3 | Install & verify mech. latches & retention dev. | (4) | | | X | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.2 Solar Physics Dedicated Mission Interface Checkout Matrix (Cont)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 32.0 | Orbiter avionics test | (4) | Launch site | | X | | | | |
| 32.1 | Verify compatibility of experiment avionics with shuttle support avionics | (4) | | | X | | | | |
| | | | | | | | | | |
| 33.0 | EMC/RFI test | (4) | | | X | | | | |
| | | | | | | | | | |
| 34.0 | Closeout of payload bay | (4) | | | X | | | | |
| | | | | | | | | | |
| 35.0 | Ready for Launch Operations | (4) | | | X | | | | |
| | | | | | | | | | |
| 36.0 | Launch Operations | (4) | | | X | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS STIMULATED

(4) DIRECT ORBITER I/F

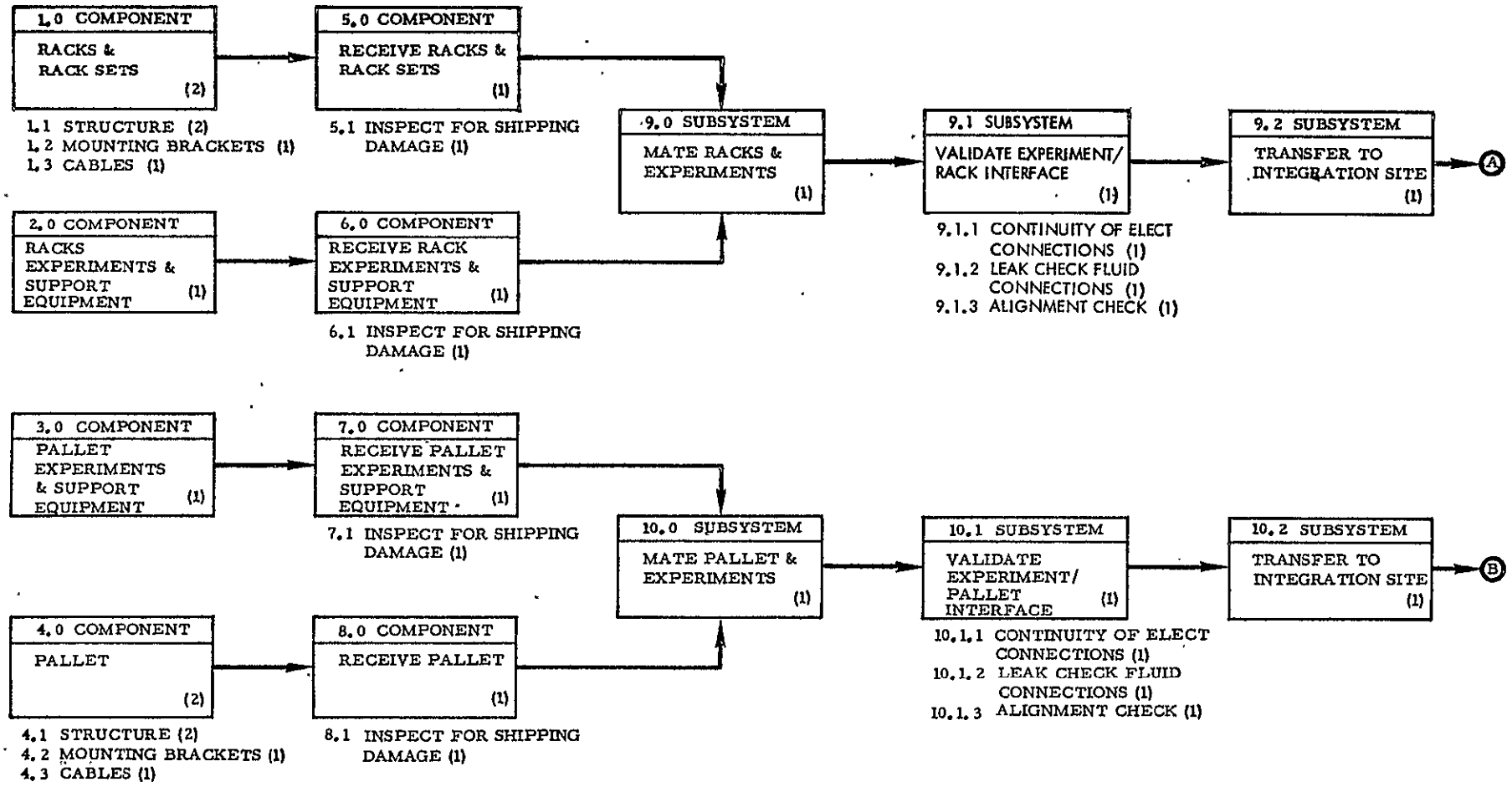



Figure C-3 Module with Pallet (Spacelab)

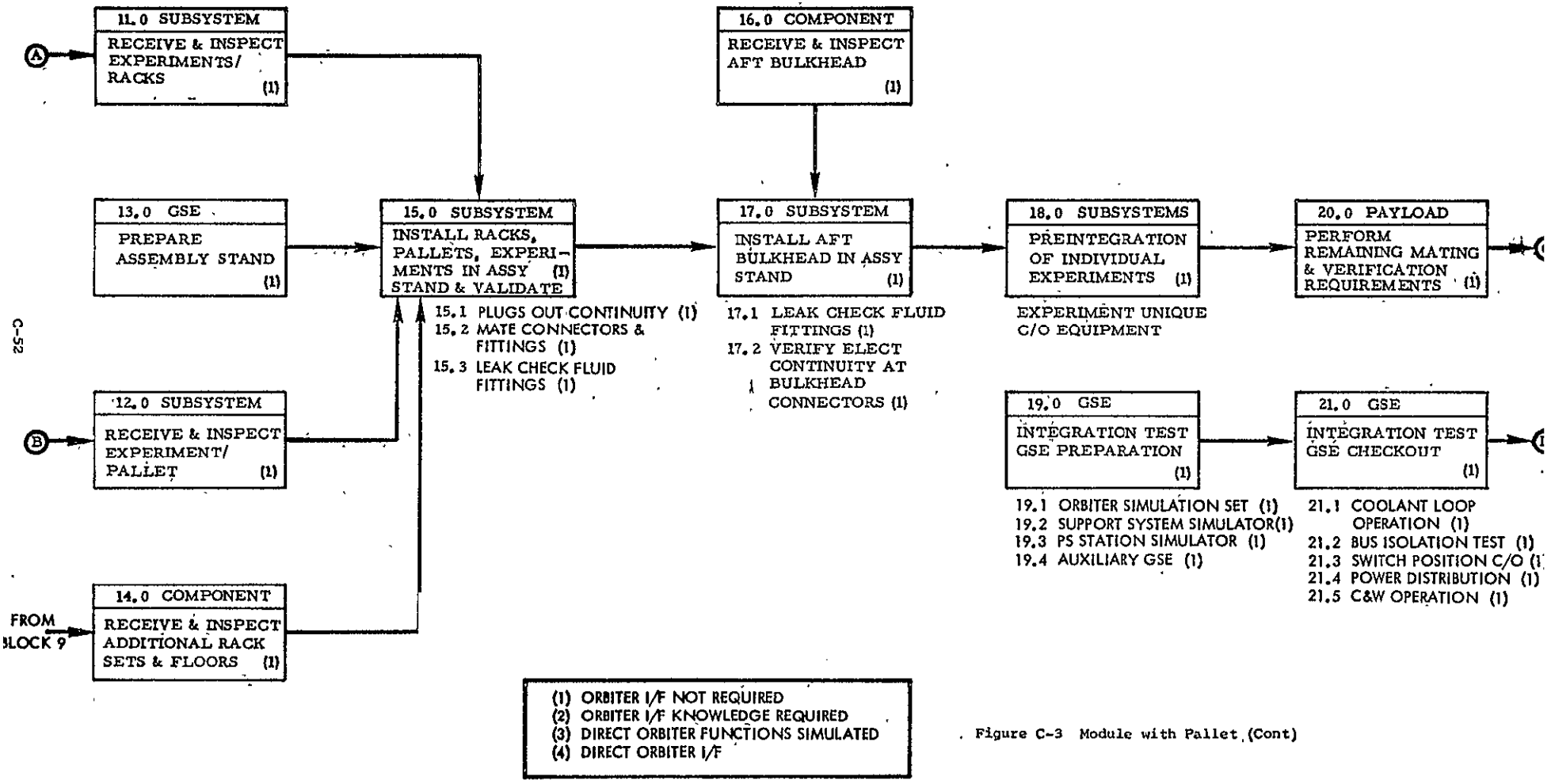



Figure C-3 Module with Pallet (Cont)

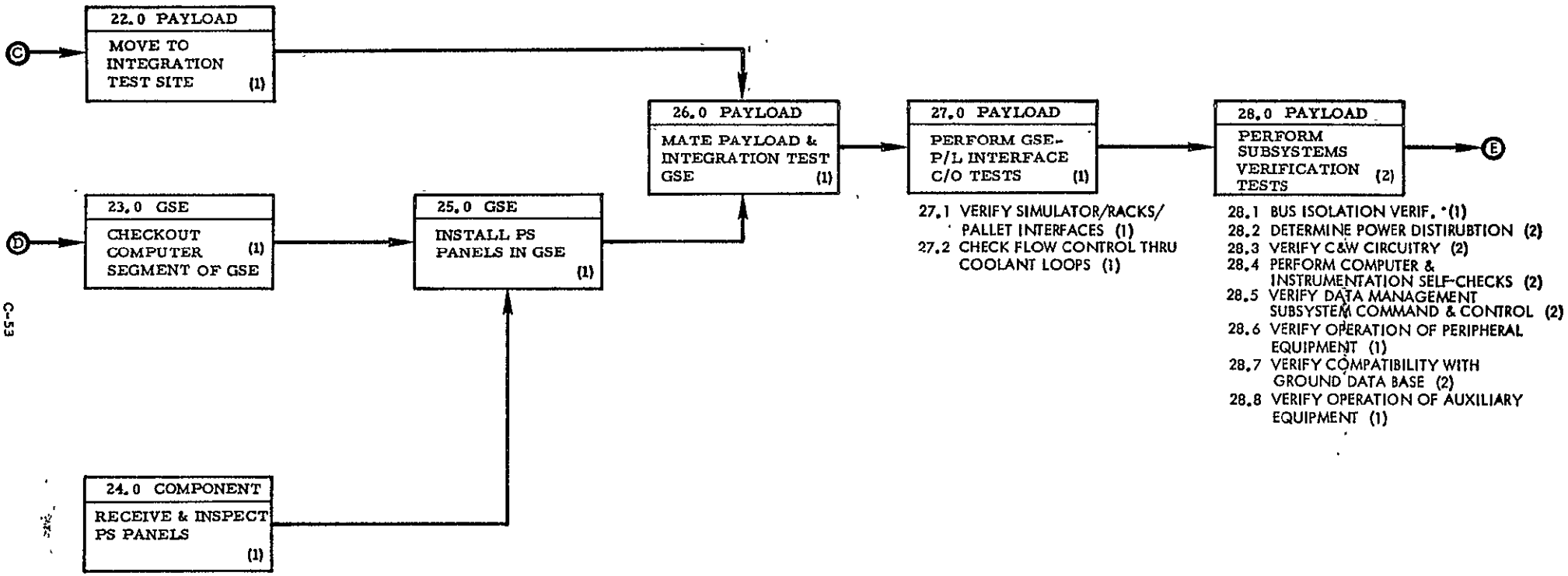



Figure C-3 Module with Pallet (Cont)

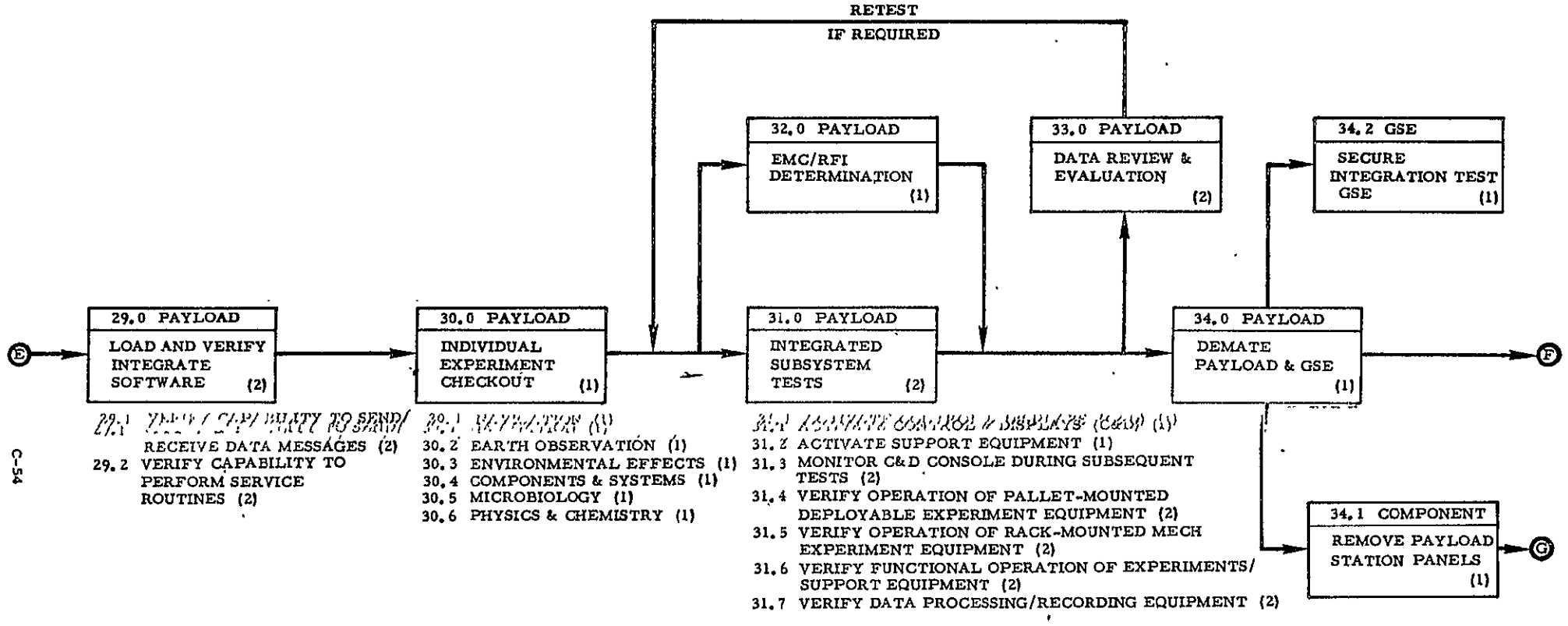
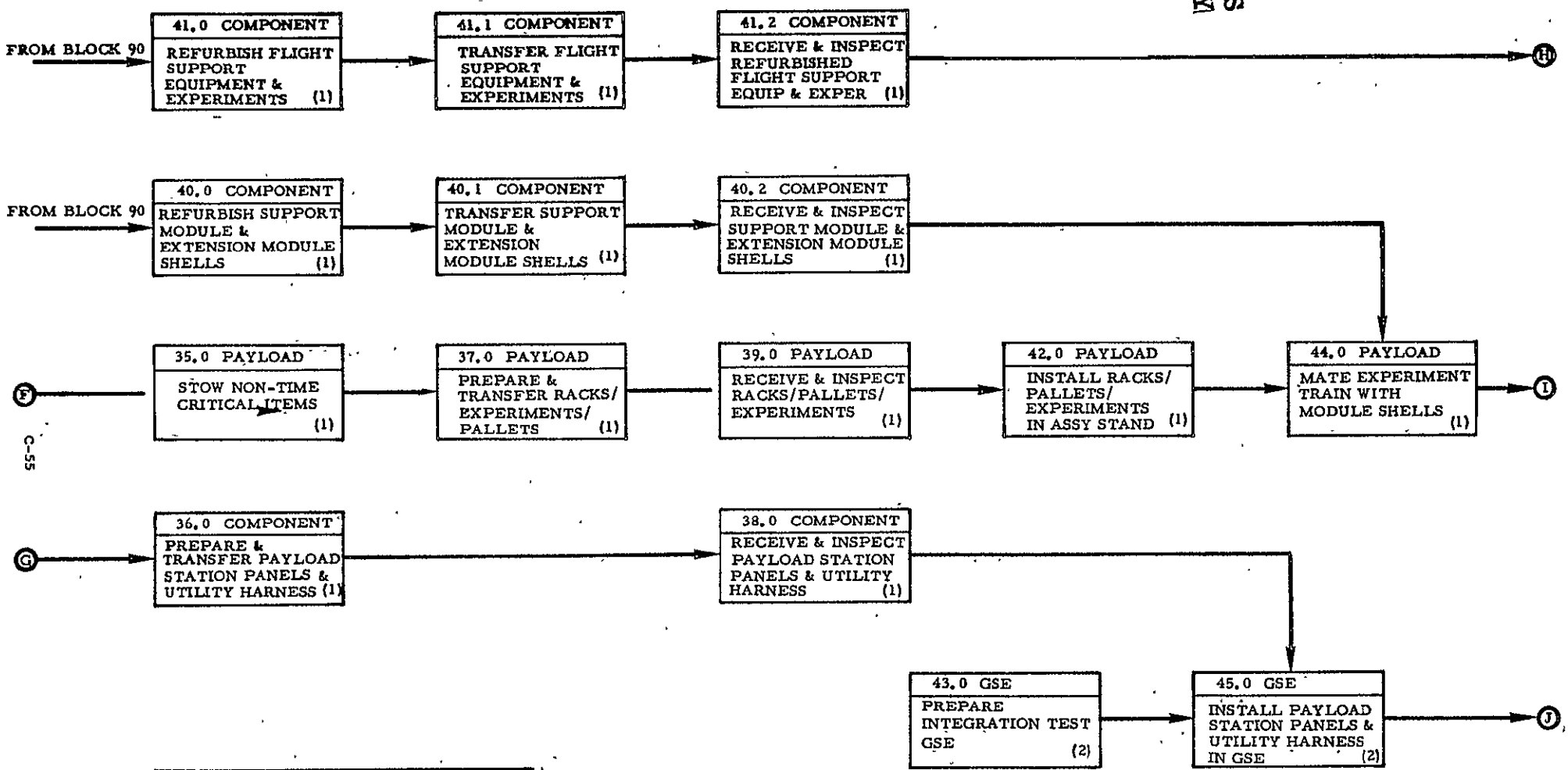



Figure C-3 Module with Pallet (Cont)




C-55

(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

43.1 ORBITER ELECT I/F SIMULATORS (2)
43.2 ORBITER MECH I/F SIMULATORS (2)
43.3 SERVICING UNITS (1)
43.4 FACILITY I/F EQUIPMENT (1)
43.5 PAYLOAD STATION SIMULATORS (2)

Figure C-3 Module with Pallet (Cont)

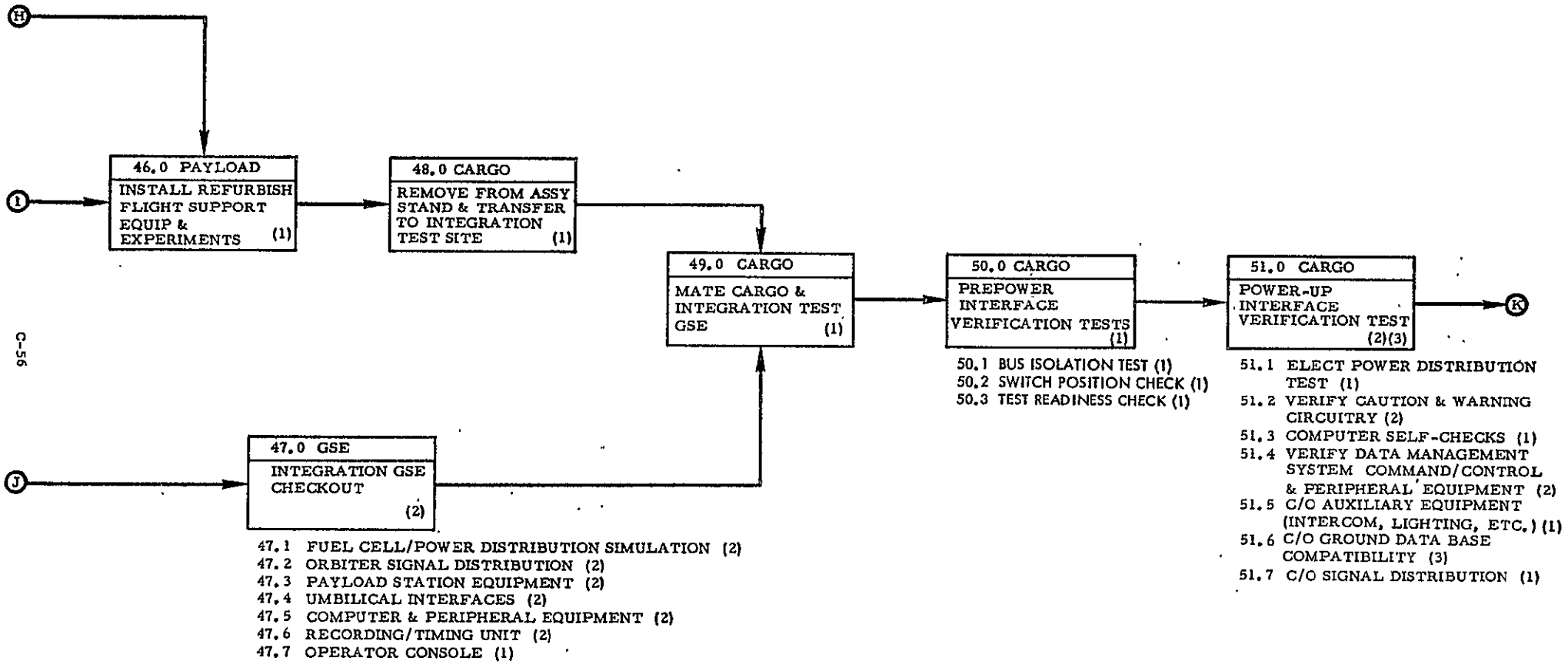
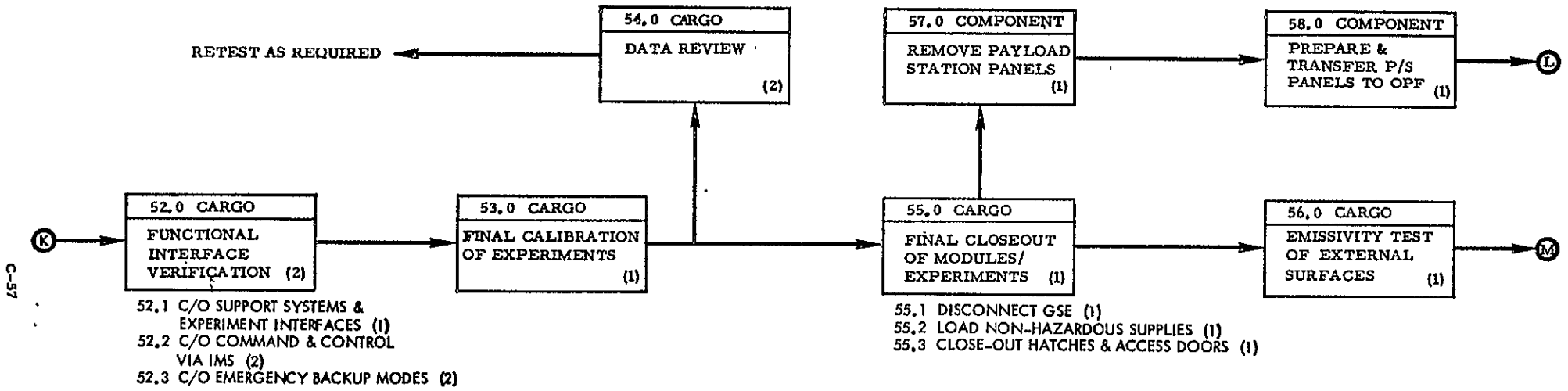
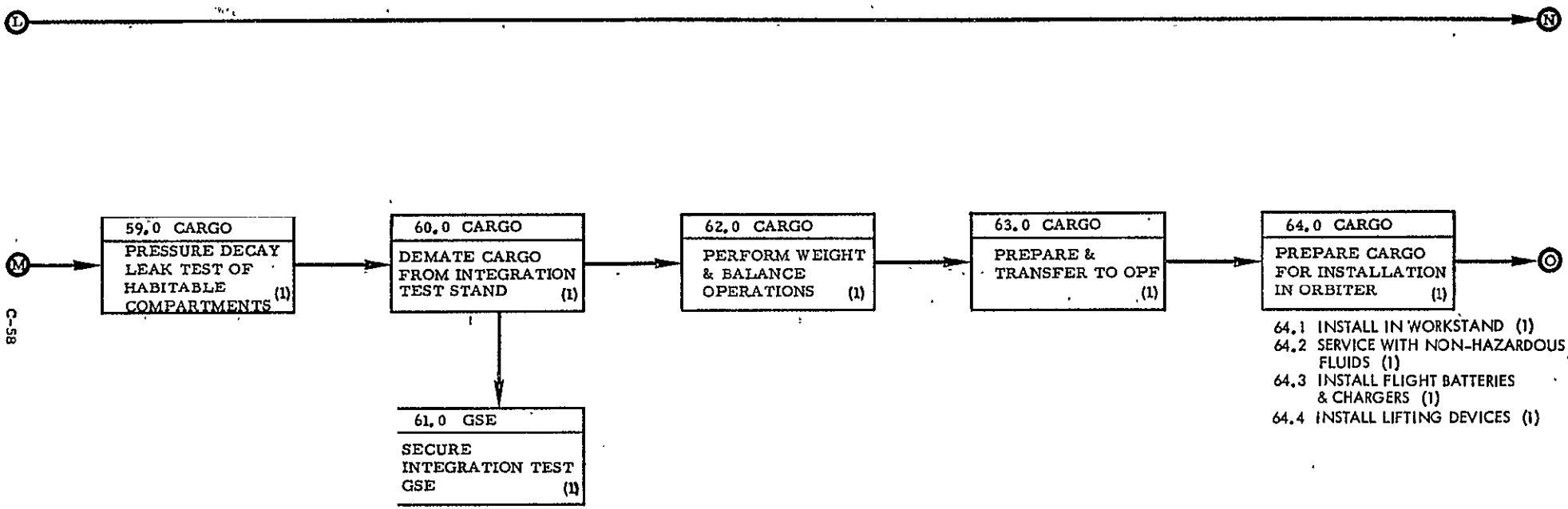



Figure C-3 Module with Pallet (Cont)



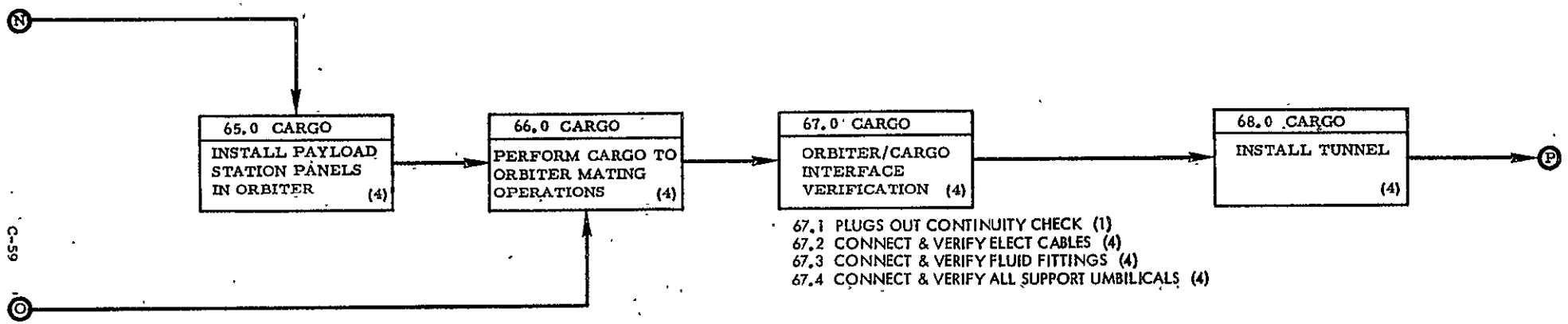

(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-3 Module with Pallet (Cont)




(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-3 Module with Pallet (Cont)




(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-3 Module with Pallet (Cont)

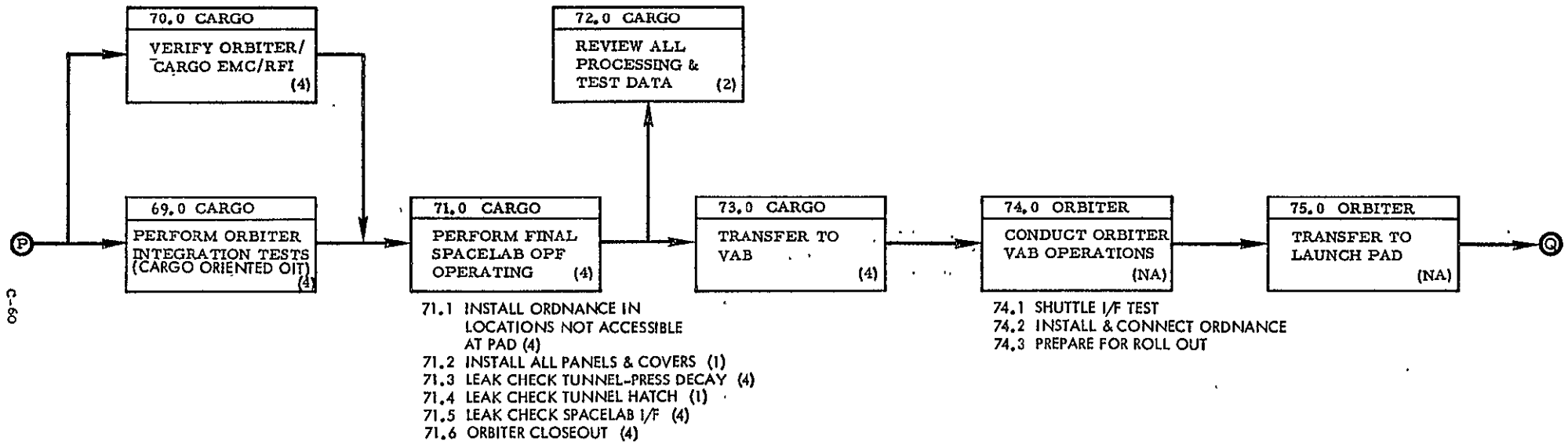
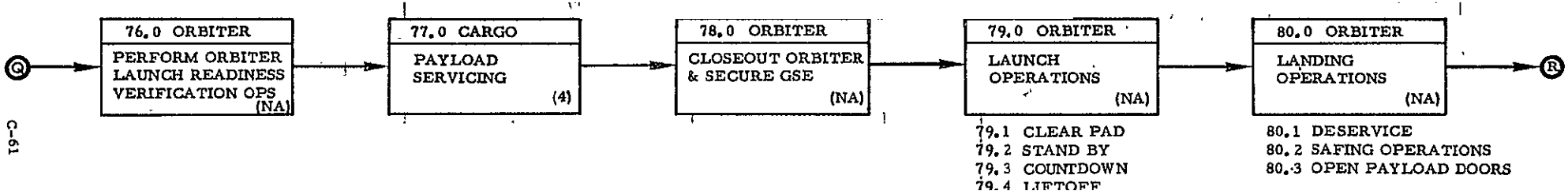
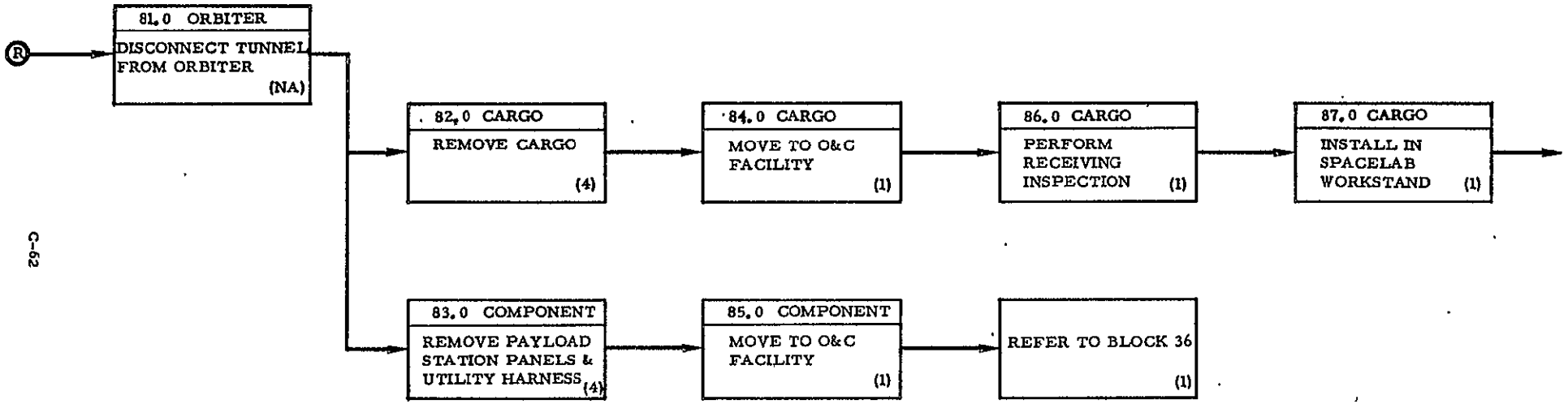



Figure C-3 Module with Pallet (Cont)




(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-3 Module with Pallet (Cont)




(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-3 Module with Pallet (Cont)

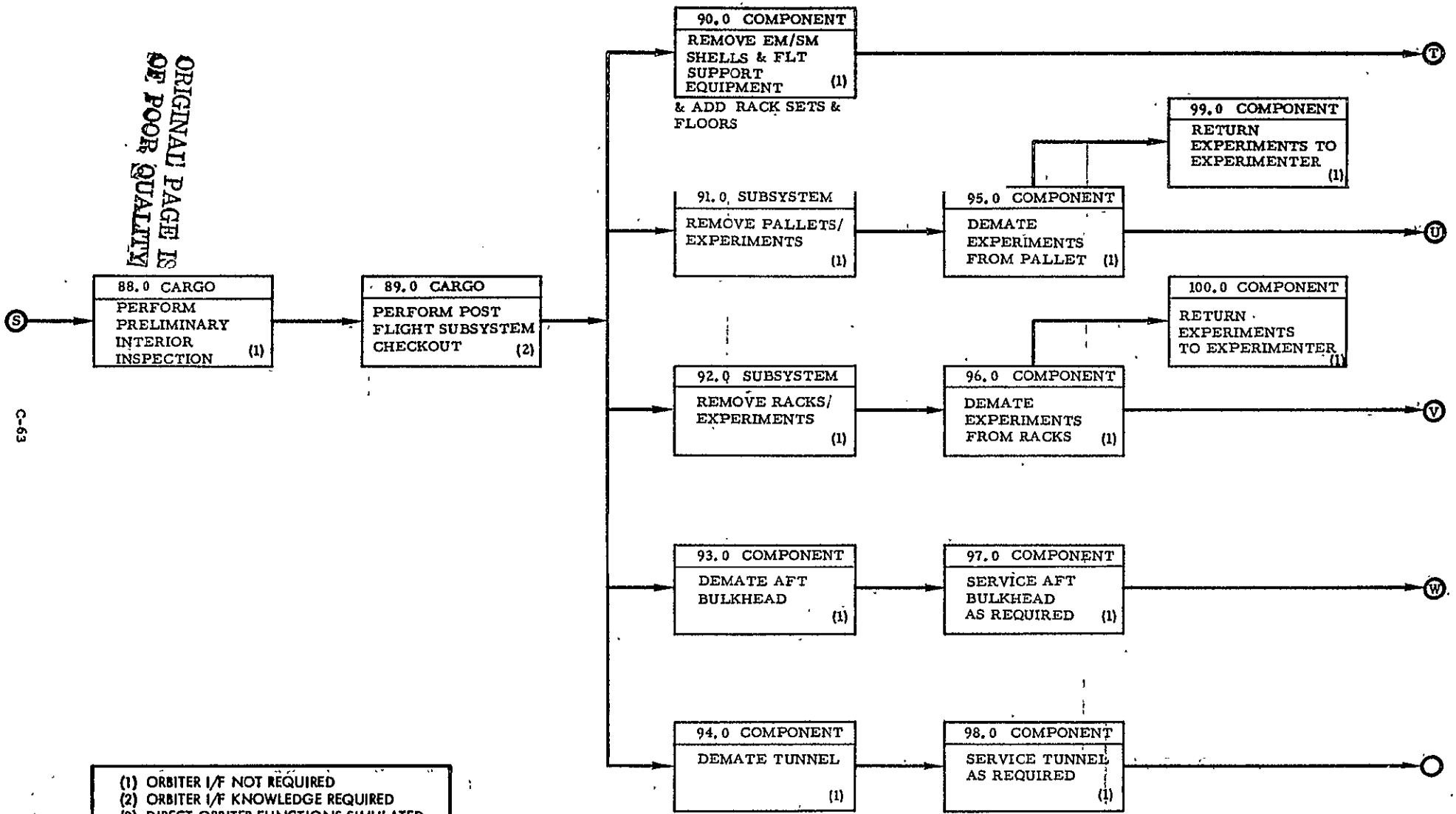



Figure C-3 Module with Pallet (Cont)

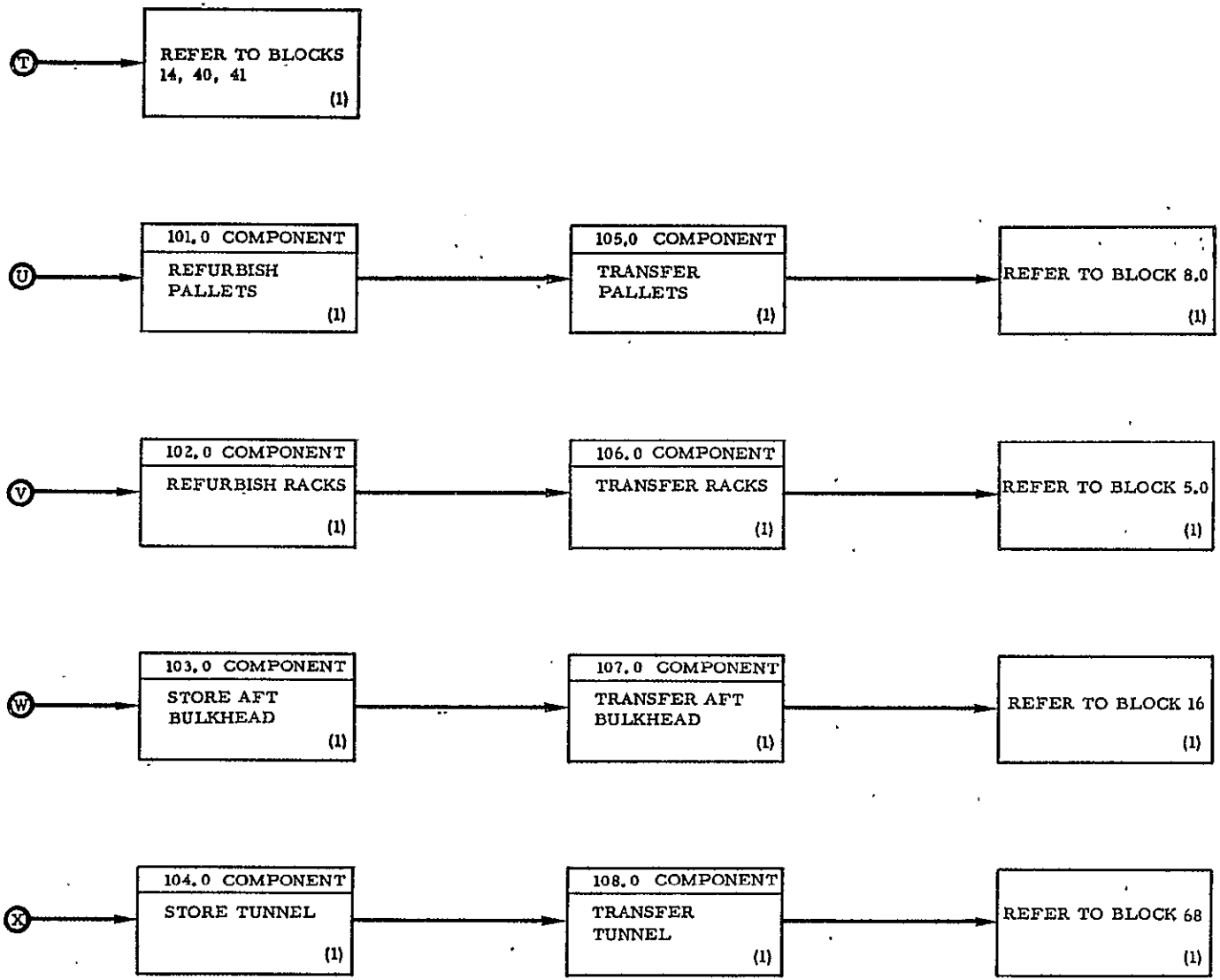



Figure C-3 Module with Pallet (Cont)

Table C.3 MODULE WITH PALLET (SPACE)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | MATES |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 1.0 | Racks and rack sets | (2) | User | X | | | | | Various sources |
| 1.1 | Structure | (2) | | X | | | | | |
| 1.2 | Mounting brackets | (1) | | X | | | | | |
| 1.3 | Cables | (1) | | X | | | | | |
| | | | | | | | | | |
| 2.0 | Racks experiments & support equipment | (1) | | X | | | | | |
| | | | | | | | | | |
| 3.0 | Pallet experiments & support equipment | (1) | | X | | | | | |
| | | | | | | | | | |
| 4.0 | Pallet | (2) | | X | | | | | |
| 4.1 | Structure | (2) | | X | | | | | |
| 4.2 | Mounting brackets | (1) | | X | | | | | |
| 4.3 | Cables | (1) | | X | | | | | |
| | | | | | | | | | |
| 5.0 | Receive racks & rack sets | (1) | | X | | | | | |
| 5.1 | Inspect for shipping damage | (1) | | X | | | | | |
| | | | | | | | | | |
| 6.0 | Receive racks experiments & support equipment | (1) | | X | | | | | |
| 6.1 | Inspect for shipping damage | (1) | | X | | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLET (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 7.0 | Receive pallet experiments & support equipment | (1) | User | X | | | | | Various sources |
| 7.1 | Inspect for shipping damage | (1) | | X | | | | | |
| | | | | | | | | | |
| 8.0 | Receive pallet | (1) | | X | | | | | |
| 8.1 | Inspect for shipping damage | (1) | | X | | | | | |
| | | | | | | | | | |
| 9.0 | Mate racks and experiments | (1) | | X | | | | | |
| 9.1 | Validate experiment/rack interface | (1) | | X | | | | | |
| 9.1.1 | Continuity of electrical connections | (1) | | X | | | | | |
| 9.1.2 | Leak check fluid connections | (1) | | X | | | | | |
| 9.1.3 | Alignement check | (1) | | X | | | | | |
| 9.2. | Transfer to integration site (user) | (1) | | X | | | | | |
| | | | | | | | | | |
| 10.0 | Mate pallet and experiments | (1) | | X | | | | | |
| 10.1 | Validate experiment/pallet interface | (1) | | X | | | | | |
| 10.1.1 | Continuity of electrical connections | (1) | | X | | | | | |
| 10.1.2 | Leak check of fluid connections | (1) | | X | | | | | |
| 10.1.3 | Alignement check | (1) | | X | | | | | |
| 10.2 | Transfer to integration site | (1) | | X | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLET (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 11.0 | Receive & inspect experiments/racks | (1) | User | X | | | | | |
| 12.0 | Receive & inspect experiment/pallet | (1) | | X | | | | | |
| 13.0 | Prepare assembly stand | (1) | | X | | | | | |
| 14.0 | Receive & inspect additional rack sets & floor | (1) | | X | | | | | |
| 15.0 | Install racks, pallets, experiments in assembly stand & validate | (1) | | X | | | | | |
| 15.1 | Plugs out continuity | (1) | | X | | | | | |
| 15.2 | Mate connectors and fittings | (1) | | X | | | | | |
| 15.3 | Leak check fluid fittings | (1) | | X | | | | | |
| 16.0 | Receive and inspect aft bulkhead | (1) | | X | | | | | |
| 17.0 | Install aft bulkhead in assembly stand | (1) | | X | | | | | |
| 17.1 | Leak check fluid fittings | (1) | | X | | | | | |
| 17.2 | Verify electrical continuity at bulkh. conn. | (1) | | X | | | | | |

(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLET (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 18.0 | Pre-integration of individual experiments | (1) | User | X | X | | | | Unique C/O equipment required. Either site:trade study. |
| 19.0 | Integration test GSE preparation | (1) | | X | X | X | | | Either site. |
| 19.1 | Orbiter simulation set | (1) | | X | X | X | | | |
| 19.2 | Support system simulator | (1) | | X | X | X | | | |
| 19.3 | PS station simulator | (1) | | X | X | X | | | |
| 19.4 | Auxiliary GSE | (1) | | X | X | X | | | |
| 20.0 | Perform remaining mating & verif. requirements | (1) | | X | X | | | | Either site: trade study. |
| 21.0 | Integration test GSE checkout | (1) | | X | X | | | | Either site. |
| 21.1 | Coolant loop operation | (1) | | X | X | | | | |
| 21.2 | Bus isolation test | (1) | | X | X | | | | |
| 21.3 | Switch position checkout | (1) | | X | X | | | | |
| 21.4 | Power distribution | (1) | | X | X | | | | |
| 21.5 | Caution & warning operation | (1) | | X | X | | | | |
| 22.0 | Move to integration test site | (1) | | X | X | | | | Either site |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLET (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 23.0 | Checkout computer segment of GSE | (1) | User | X | X | | | | Either site |
| 23.1 | Console operation | (1) | | X | X | | | | |
| 23.2 | Computer/instrumentation selfcheck | (1) | | X | X | | | | |
| 23.3 | Verify command/control capability | (1) | | X | X | | | | |
| | | | | | | | | | |
| 24.0 | Receive & inspect PS panels | (1) | | X | X | | | | |
| | | | | | | | | | |
| 25.0 | Install PS panels in GSE | (1) | | X | X | | | | |
| | | | | | | | | | |
| 26.0 | Mate payload and integration test GSE | (1) | | X | X | | | | |
| | | | | | | | | | |
| 27.0 | Perform GSE/payload interface c/o tests | (1) | | X | X | X | X | | Either site; trade study |
| 27.1 | Verify simulator/racks/pallet interfaces | (1) | | X | X | X | X | | |
| 27.2 | Check control loops flow control | (1) | | X | X | X | X | | |
| | | | | | | | | | |
| 28.0 | Perform subsystem verification tests | (2) | | X | X | X | X | | Trade study |
| 28.1 | Bus isolation verivication | (1) | | X | X | X | X | | |
| 28.2 | Determine power distribution | (2) | | X | X | X | X | | |
| 28.3 | Verify caution & warning circuitry | (2) | | X | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLET (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 28.4 | Perform computer & instrumentation selfchecks | (2) | User | X | X | X | X | | Trade study |
| 28.5 | Verify data management subsystem com.& control | (1) | | X | X | X | X | | |
| 28.6 | Verify operation of peripheral equipment | (1) | | X | X | X | X | | |
| 28.7 | Verify compatibility with ground data base | (2) | | X | X | X | X | | |
| 28.8 | Verify operation of auxiliary equipment | (1) | | X | X | X | X | | |
| | | | | | | | | | |
| 29.0 | Load and verify integrated software | (2) | | X | X | X | X | | Either site |
| 29.1 | Verify capability to send/receive data messages | (2) | | X | X | X | X | | |
| 29.2 | Verify capability to perform service routines | (2) | | X | X | X | X | | |
| | | | | | | | | | |
| 30.0 | Individual experiment checkout | (1) | | X | X | | | | Unique experiment equipment |
| 30.1 | Navigation | (1) | | X | X | | | | |
| 30.2 | Earth observation | (1) | | X | X | | | | |
| 30.3 | Environmental effects | (1) | | X | X | | | | |
| 30.4 | Components & systems | (1) | | X | X | | | | |
| 30.5 | Microbiology | (1) | | X | X | | | | |
| 30.6 | Physics and chemistry | (1) | | X | X | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLET (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 31.0 | Integrated subsystem tests | (2) | User | X | X | X | X | | Trade study |
| 31.1 | Activate control and displays | (1) | | X | X | X | X | | |
| 31.2 | Activate support equipment | (1) | | X | X | X | X | | |
| 31.3 | Monitor C&D console during subsequent tests | (2) | | X | X | X | X | | |
| 31.4 | Verify operation of pallet-mtd deployable experiment equipment | (2) | | X | X | X | X | | |
| 31.5 | Verify operation of rack-mtd mechanical experiment equipment | (2) | | X | X | X | X | | |
| 31.6 | Verify functional operation of experiments/support equipment | (2) | | X | X | X | X | | |
| 31.7 | Verify data processing/recording equipment | (2) | | X | X | X | X | | |
| 32.0 | EMC/RFI determination | (1) | | X | X | | | | Special equipment required |
| 33.0 | Data review and evaluation | (2) | | X | X | | | | Can be accomplished anywhere |
| 34.0 | De-mate payload & GSE | (1) | | X | X | | | | |
| 34.1 | Remove payload station panels | (1) | | X | X | | | | |
| 34.2 | Secure integration test GSE | (1) | | X | X | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLET (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 35.0 | Stow non time-critical items | (1) | User | X | X | | | | Either site |
| 36.0 | Prepare & transfer P/L staion panels & util.harn. | (1) | ↓ | X | X | | | | ↓ |
| 37.0 | Prepare & transfer racks/experiments/pallets | (1) | | X | X | | | | |
| 38.0 | R & I payload station panels & utility harness | (1) | | X | X | | | | |
| 39.0 | R & I racks/pallets/experiments | (1) | ↓ | X | X | | | | |
| 40.0 | Refurbish SM & extension module shells | (1) | Launch site | | X | | | | |
| 40.1 | Transfer SM & extension module shells | (1) | ↓ | | X | | | | |
| 40.2 | R & I SM & extension module shells | (1) | | | X | | | | |
| 41.0 | Refurbish FS equipment & experiments | (1) | | | X | | | | |
| 41.1 | Transfer FS equipment & experiments | (1) | | | X | | | | |
| 41.2 | R & I refurbished FS equipment & experiments | (1) | | | X | | | | |
| 42.0 | Install racks/pallets/experiments in assy stand | (1) | | | X | | | | |
| 43.0 | Prepare integration test GSE | (2) | | X | X | X | X | | Either site; trade study |
| 43.1 | Orbiter electrical I/F simulators | (2) | | X | X | X | X | | ↓ |
| 43.2 | Orbiter mechanical I/F simulators | (2) | | X | X | X | X | | |
| 43.3 | Servicing units | (1) | | X | X | X | X | | |
| 43.4 | Facility I/F equipment | (1) | | X | X | X | X | | |
| 43.5 | Payload station simulator | (2) | | X | X | X | X | | ↓ |
| 44.0 | Mate experiment train with module shells | (1) | ↓ | X | X | | | | Either site |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLET (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 45.0 | Install P/L station panels & utility Harness in GSE | (2) | Launch site | X | X | | | | Either site |
| 46.0 | Install refurbished FS equipment & experiments | (1) | | | X | | | | |
| 47.0 | Integration GSE checkout | (2) | | X | X | X | X | | Either site |
| 47.1 | Fuel cell/power distribution simulation | (2) | | X | X | X | X | | |
| 47.2 | Orbiter signal distribution | (2) | | X | X | X | X | | |
| 47.3 | Payload station equipment | (2) | | X | X | X | X | | |
| 47.4 | Umbilical interfaces | (2) | | X | X | X | X | | |
| 47.5 | Computer & peripheral equipment | (2) | | X | X | X | X | | |
| 47.6 | Recording/timing unit | (2) | | X | X | X | X | | |
| 47.7 | Operator console | (1) | | X | X | X | X | | |
| 48.0 | Remove from assy stnd & transfer to int.test site | (1) | | | X | | | | |
| 49.0 | Mate cargo & integration test GSE | (1) | | | X | X | X | | GSE simulator Vs IVE trade study |
| 50.0 | Pre-power interface verification tests | (1) | | See remarks | X | | X | | If accomplished at User site, demate, ship, remate and reverify at launch site |
| 50.1 | Bus isolation test | (1) | | | X | | X | | |
| 50.2 | Switch position check | (1) | | | X | | X | | |
| 50.3 | Test readiness check | (1) | | | X | | X | | |
| 51.0 | Power-up interface verification test | (2),(3) | | | X | X | X | | |
| 51.1 | Electrical power distribution test | (1) | | | X | X | X | | |
| 51.2 | Verify caution &warning circuitry | (2) | | | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLET (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 51.3 | Computer self checks | (1) | Launch site | | X | X | X | | If accomplished at User site, demate, ship, remate and reverify at launch site |
| 51.4 | Verify data mangement system command/control & peripherel equipment | (2) | | | X | X | X | | |
| 51.5 | Checkout auxiliary equipment (intercom, lighting, etc.) | (1) | | | X | X | X | | |
| 51.6 | C/O ground data base compatibility | (3) | | | X | X | X | | |
| 51.7 | Checkout signal distribution | (1) | | | X | X | X | | |
| 52.0 | Functional interface verification | (2) | | | X | X | X | | |
| 52.1 | C/Osupport systems & experiment interfaces | (1) | | | XX | X | X | | |
| 52.2 | Checkout command & control via IMS | (2) | | | X | X | X | | |
| 52.3 | Checkout emergency backup modes | (2) | | | X | X | X | | |
| 53.0 | Final calibration of experiments | (1) | | | X | | | | Experiment unique equipment |
| 54.0 | Data review | (2) | | | X | | | | Can be accomplished anywhere |
| 55.0 | Final closeout of modules/experiments | (1) | | | X | | | | |
| 55.1 | Disconnect GSE | (1) | | | X | | | | |
| 55.2 | Load non-hazardous supplies | (1) | | | X | | | | |
| 55.3 | Closeout hatches & access doors | (1) | | | X | | | | |
| 56.0 | Emissivity test of external surfaces | (1) | | | X | | | | |
| 57.0 | Remove payload station panels | (1) | | | X | | | | |
| 58.0 | Prepare & transfer P.S panels to OPF | (1) | | | X | | | | |
| 59.0 | Pressure decay leak test of habitable compartment | (1) | | | X | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLET (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 60.0 | Demate cargo from integration stand | (1) | Launch site | | X | | | | |
| 61.0 | Secure integration test GSE | (1) | | | X | | | | |
| 62.0 | Perform weight & balance operations | (1) | | | X | | | X | |
| 63.0 | Prepare & transfer to OPF | (1) | | | X | | | X | Special handling equipment |
| 64.0 | Prepare cargo for installation in orbiter | (1) | | | X | | | | |
| 64.1 | Install in workstand | (1) | | | X | | | | |
| 64.2 | Service with non-hazardous fluids | (1) | | | X | | | | |
| 64.3 | Install flight batteries and chargers | (1) | | | X | | | | |
| 64.4 | Install lifting devices | (1) | | | X | | | | |
| 65.0 | Install payload station panels in orbiter | (4) | | | X | | | | |
| 66.0 | Perform cargo to orbiter mating operations | (4) | | | X | | | | |
| 67.0 | Orbiter/cargo interface verification | (4) | | | X | | | | Orbiter responsibility |
| 67.1 | Plugs out continuity check | (1) | | | X | | | | |
| 67.2 | Connect & verify electrical cables | (4) | | | X | | | | |
| 67.3 | Connect & verify fluid fittings | (4) | | | X | | | | |
| 67.4 | Connect & verify all support umbilicals | (4) | | | X | | | | |
| 68.0 | Install tunnel | (4) | | | X | | | | |
| 69.0 | Perform orbiter integration test (cargo oriented OIT) | (4) | | | X | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLETS (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 70.0 | Verify orbiter/cargo EMC/RFI | (4) | Launch site | | X | | | | Orbiter responsibility |
| 70.1 | Monitor during OIT functional tests | (4) | ↓ | | X | | | | ↓ |
| 71.0 | Perform final spacelab OPF operations | (4) | | | X | | | | Use OPF equipment |
| 71.1 | Install ordnance in locations not accessible at pad | (4) | | | X | | | | ↓ |
| 71.2 | Install all panels and covers | (1) | | | X | | | | |
| 71.3 | Leak-check tunnel pressure decay | (4) | | | X | | | | |
| 71.4 | Leak check tunnel hatch | (1) | | | X | | | | |
| 71.5 | Leak check spacelab interface | (4) | | | X | | | | |
| 71.6 | Orbiter closeout | (4) | | | X | | | | ↓ |
| 72.0 | Review all processing & test data | (2) | | | X | | | | |
| 73.0 | Transfer to VAB | (4) | | | X | | | | Orbiter responsibility |
| 74.0 | Conduct orbiter VAB operations | NA | | | X | | | | |
| 74.1 | Shuttle interface test | NA | | | X | | | | |
| 74.2 | Install & connect ordnance | NA | | | X | | | | |
| 74.3 | Prepare for roll out | NA | | | X | | | | |
| 75.0 | Transfer to launch pad | NA | | | X | | | | |
| 76.0 | Platform orbiter launch readiness verif. ops. | NA | | | X | | | | |
| 77.0 | Payload servicing | (4) | | | X | | | | As required |
| 78.0 | Closeout orbiter & secure GSE | NA | ↓ | | X | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

Table C.3 (Cont) MODULE WITH PALLETS (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 79.0 | Launch operations | NA | Launch site | | X | | | | |
| 79.1 | Clear pad | NA | | | X | | | | |
| 79.2 | Stand by | NA | | | X | | | | |
| 79.3 | Countdown | NA | | | X | | | | |
| 79.4 | Liftoff | NA | | | X | | | | |
| 80.0 | Landing operations | NA | | | X | | | | |
| 80.1 | De-service | NA | | | X | | | | |
| 80.2 | Safing operations | NA | | | X | | | | |
| 80.3 | Open payload doors | NA | | | X | | | | |
| 81.0 | Disconnect tunnel from orbiter | NA | | | X | | | | |
| 82.0 | Remove cargo | (4) | | | X | | | | |
| 83.0 | Remove P/L station panels & utility harness | (4) | | | X | | | | |
| 84.0 | Move to O & C facility | (1) | | | X | | | | |
| 85.0 | Move to O & C facility | (1) | | | X | | | | |
| 86.0 | Perform receiving inspection | (1) | | | X | | | | |
| 87.0 | Install in spacelab workstand | (1) | | | X | | | | |
| 88.0 | Perform preliminary interior inspection | (1) | | | X | | | | |
| 89.0 | Perform post-flight subsystem checkout | (2) | | | X | | | | |
| 90.0 | Remove EM/SM shells & FS equipment & additional rack sets and floors | (1) | | | X | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.3 (Cont). MODULE WITH PALLETS (SPACELAB)

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 91.0 | Remove pallets/experiments | (1) | Launch site | | X | | | | |
| 92.0 | Remove racks/experiments | (1) | | | X | | | | |
| 93.0 | Demate aft bulkhead | (1) | | | X | | | | |
| 94.0 | Demate tunnel | (1) | | | X | | | | |
| 95.0 | Demate experiments from pallet | (1) | | | X | | | | |
| 96.0 | Demate experiments from racks | (1) | | | X | | | | |
| 97.0 | Service aft bulkhead as required | (1) | | | X | | | | |
| 98.0 | Service tunnel as required | (1) | | | X | | | | |
| 99.0 | Return experiments to experimenter | (1) | | X | | | | | |
| 100.0 | Return experiments to experimenter | (1) | | X | | | | | |
| 101.0 | Refurbish pallets | (1) | | | X | | | | |
| 102.0 | Refurbish racks | (1) | | | X | | | | |
| 103.0 | Store aft bulkhead | (1) | | | X | | | | |
| 104.0 | Store tunnel | (1) | | | X | | | | |
| 105.0 | Transfer pallets | (1) | | | X | | | | |
| 106.0 | Transfer racks | (1) | | | X | | | | |
| 107.0 | Transfer aft bulkhead | (1) | | | X | | | | |
| 108.0 | Transfer tunnel | (1) | | | X | | | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

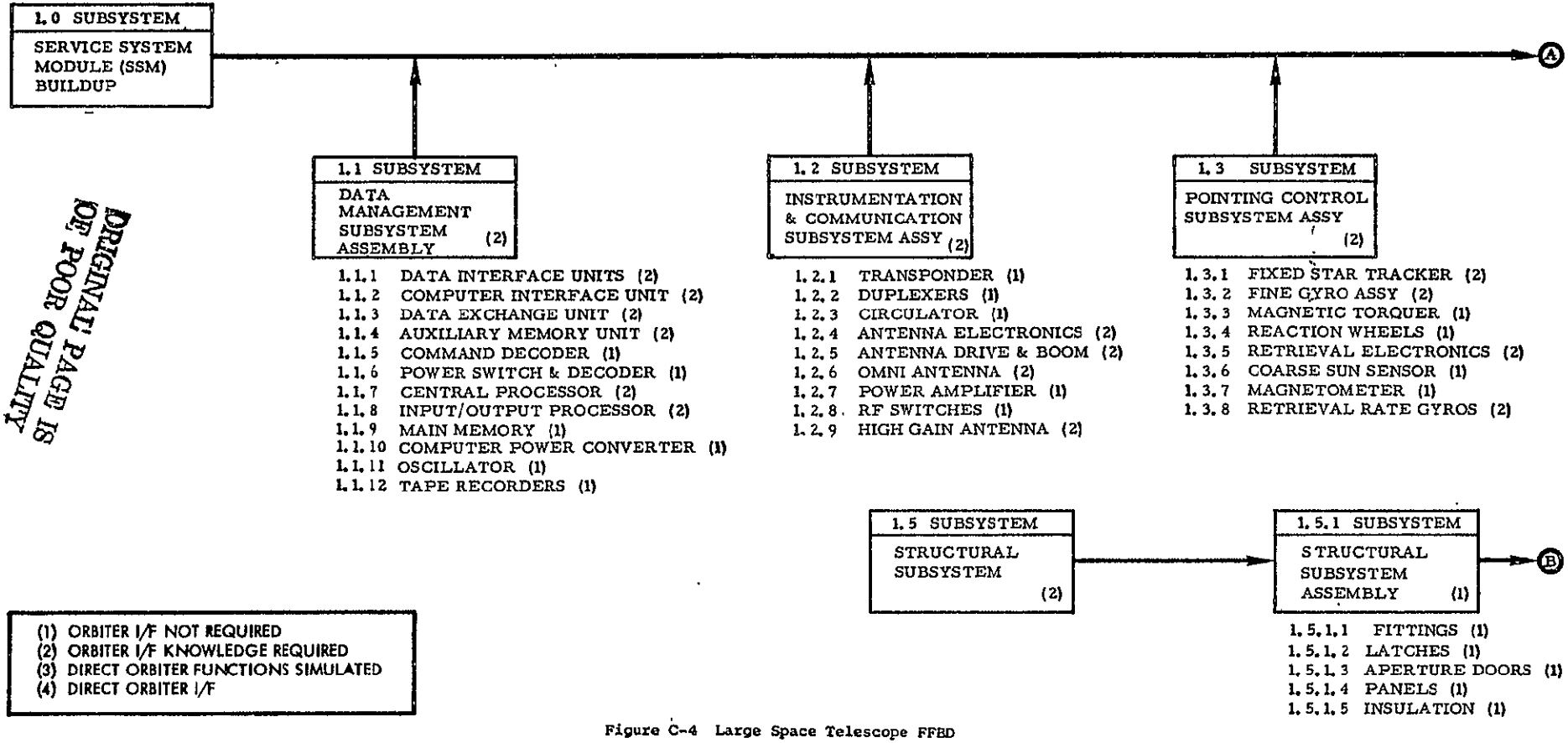





Figure C-4 Large Space Telescope FFBD

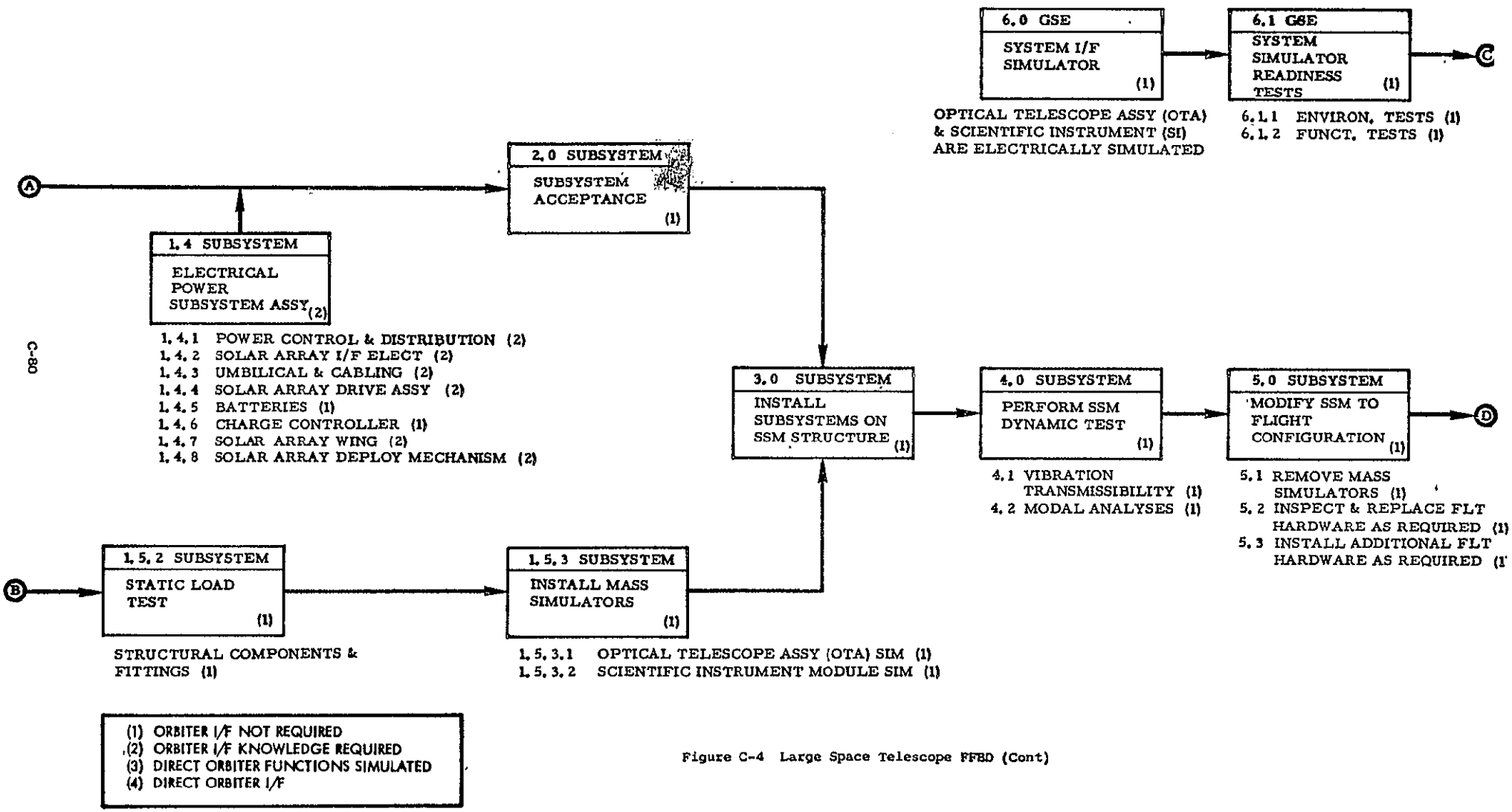
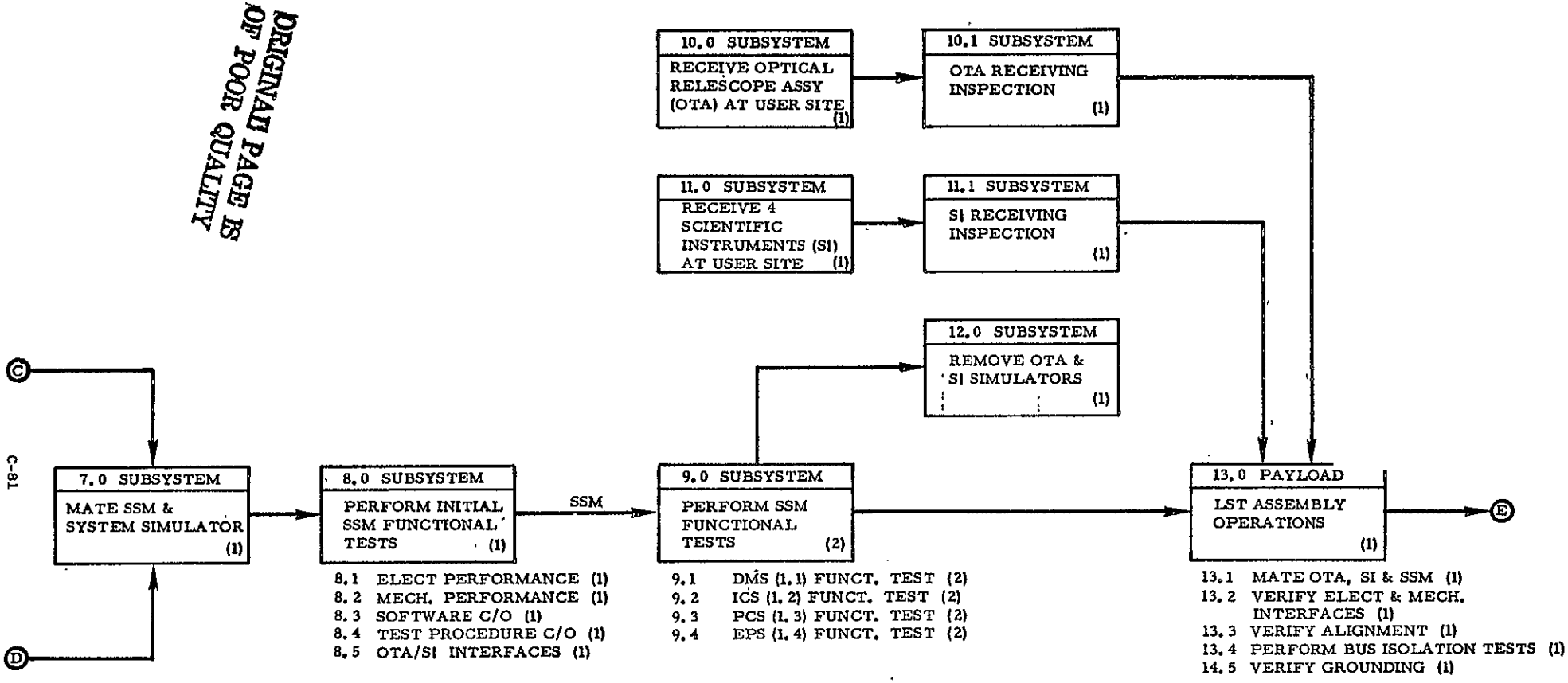
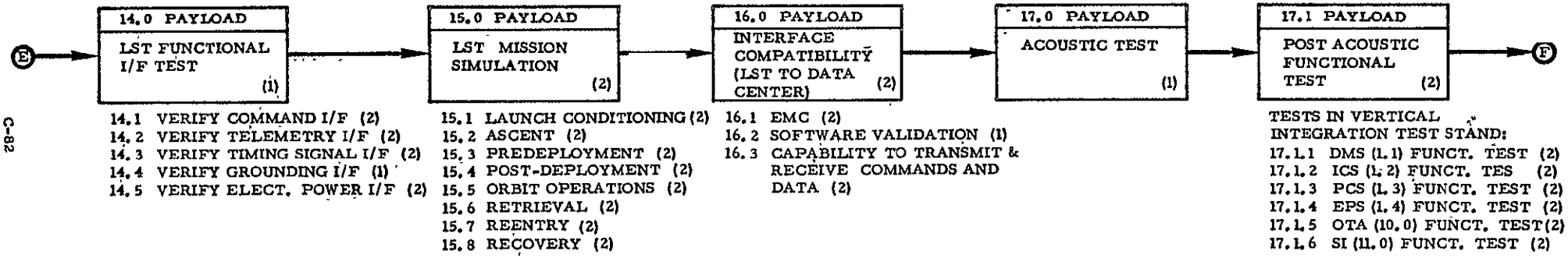



Figure C-4 Large Space Telescope FFBD (Cont)



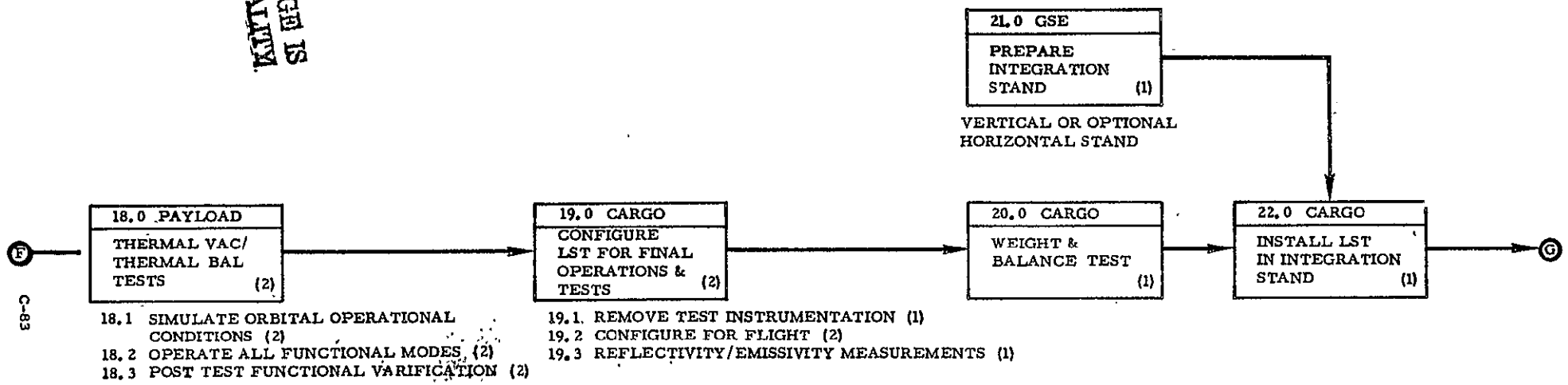

(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIERD
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-4 , Large Space Telescope FFBD (Cont)



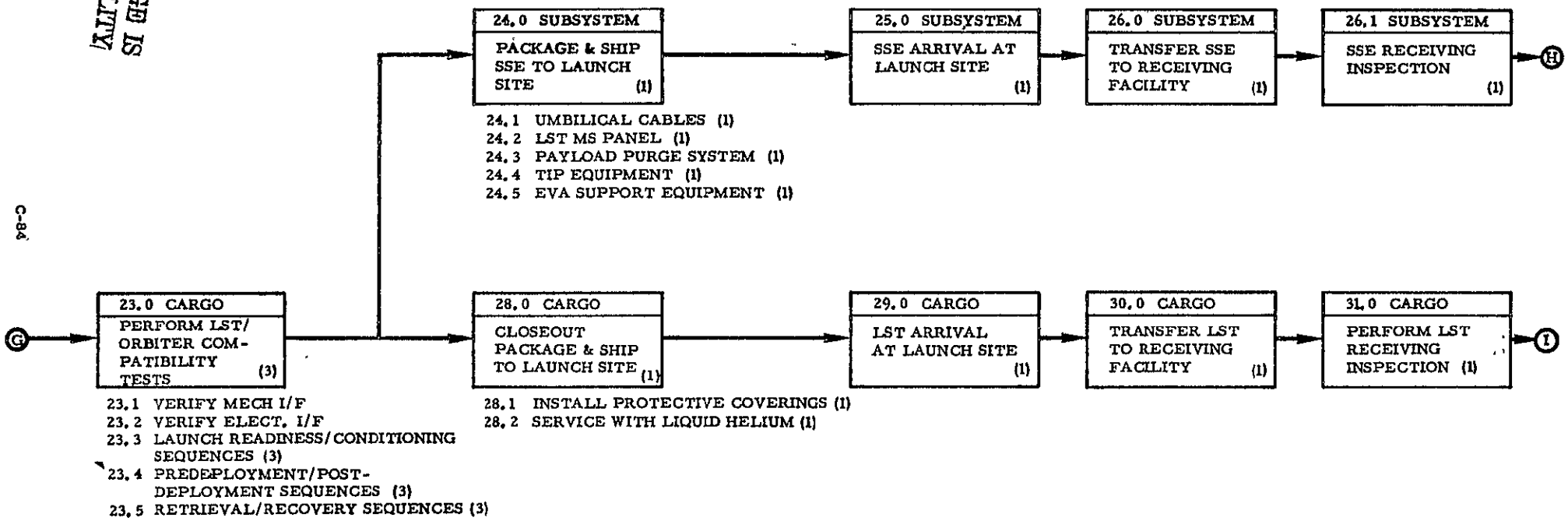

(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-4 Large Space Telescope FEBD (Cont)



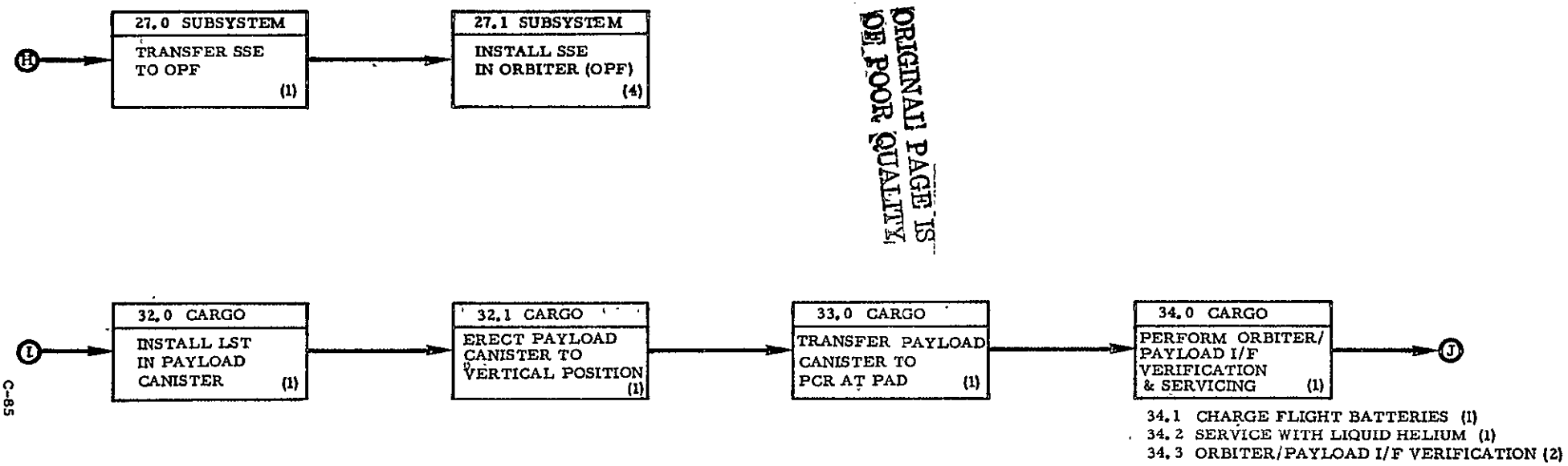

(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-4 Large Space Teleccope FFBD (Cont)




(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-4 Large Space Telescope FFBD (Cont)






(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-4 Large Space Telescope FFBD (Cont)

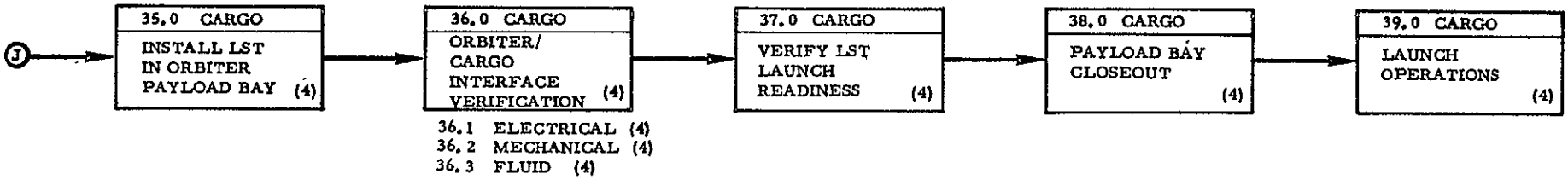





Figure C-4 Large Space Telescope FFBD (Cont)

(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNWOLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Table C.4 LST INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 1.0 | Service system module (SSM) buildup | (2) | User | X | | | | | Various sources |
| 1.1 | Data management subsystem assembly | (2) | | X | | | | | |
| 1.1.1 | Data interface units | (2) | | X | | | | | |
| 1.1.2 | Computer interface unit | (2) | | X | | | | | |
| 1.1.3 | Data exchange unit | (2) | | X | | | | | |
| 1.1.4 | Auxiliary memory unit | (2) | | X | | | | | |
| 1.1.5 | Command decoder | (1) | | X | | | | | |
| 1.1.6 | Power switch & decoder | (1) | | X | | | | | |
| 1.1.7 | Central processor | (2) | | X | | | | | |
| 1.1.8 | Input/output processor | (2) | | X | | | | | |
| 1.1.9 | Main memory | (1) | | X | | | | | |
| 1.1.10 | Computer power converter | (1) | | X | | | | | |
| 1.1.11 | Oscillator | (1) | | X | | | | | |
| 1.1.12 | Tape recorders | (1) | | X | | | | | |
| 1.2 | Instrumentation & communication subsystem assy | (2) | | X | | | | | |
| 1.2.1 | Transponder | (1) | | X | | | | | |
| 1.2.2 | Duplexers | (1) | | X | | | | | |
| 1.2.3 | Circulator | (1) | | X | | | | | |
| 1.2.4 | Antenna electronics | (2) | | X | | | | | |

(1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

**Table C.4 (Cont) LST INTERFACE CHECKOUT MATRIX**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 1.2.5 | Antenna drive and boom | (2) | User | X | | | | | Various sources |
| 1.2.6 | Omni antenna | (2) | | X | | | | | |
| 1.2.7 | Power amplifier | (1) | | X | | | | | |
| 1.2.8 | RF switches | (1) | | X | | | | | |
| 1.2.9 | High gain antenna | (2) | | X | | | | | |
| 1.3 | Pointing control subsystem assembly | (2) | | X | | | | | |
| 1.3.1 | Fixed star tracker | (2) | | X | | | | | |
| 1.3.2 | Fine gyro assembly | (2) | | X | | | | | |
| 1.3.3 | Magnetic torquer | (1) | | X | | | | | |
| 1.3.4 | Reaction wheels | (1) | | X | | | | | |
| 1.3.5 | Retrieval electronics | (2) | | X | | | | | |
| 1.3.6 | Coarse sun sensor | (1) | | X | | | | | |
| 1.3.7 | Magnetometer | (1) | | X | | | | | |
| 1.3.8 | Retrieval rate gyros | (2) | | X | | | | | |
| 1.4 | Electrical power subsystem assembly | (2) | | X | | | | | |
| 1.4.1 | Power control & distribution | (2) | | X | | | | | |
| 1.4.2 | Solar array electrical interface | (2) | | X | | | | | |
| 1.4.3 | Umbilical & cabling | (2) | | X | | | | | |
| 1.4.4 | Solar array drive assembly | (2) | | X | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION STIMULATED

(4) DIRECT ORBITER I/F

**Table C.4 (Cont) LST INTERFACE CHECKOUT MATRIX**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 1.4.5 | Batteries | (1) | User | X | | | | | Various sources |
| 1.4.6 | Charge controller | (1) | | X | | | | | |
| 1.4.7 | Sol ar array wing | (2) | | X | | | | | |
| 1.4.8 | Solar array deploy mechanism | (2) | | X | | | | | |
| 1.5 | Structural subsystem | (2) | | X | | | | | |
| 1.5.1 | Structural subsystem assembly | (1) | | X | | | | | |
| 1.5.1.1 | Fittings | (1) | | X | | | | | |
| 1.5.1.2 | Latches | (1) | | X | | | | | |
| 1.5.1.3 | Aperture doors | (1) | | X | | | | | |
| 1.5.1.4 | Panels | (1) | | X | | | | | |
| 1.5.1.5 | Insulation | (1) | | X | | | | | |
| 1.5.2 | Static load test of struct. components & fitt. | (1) | | X | | | | | |
| 1.5.3 | Install mass simulators | (1) | | X | | X | | | |
| 1.5.3.1 | Optical telescope assy (OTA) mass simulator | (1) | | X | | X | | | |
| 1.5.3.2 | Scientific instrument module mass simulator | (1) | | X | | X | | | |
| | | | | | | | | | |
| 2.0 | Subsystem acceptance | (1) | | X | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

**Table C.6 (Cont)** LST INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 3.0 | Install subsystems on SSM structure | (1) | User | X | | | | | |
| | | | | | | | | | |
| 4.0 | Perform SSM dynamic test | (1) | | X | | | | X | |
| 4.1 | Vibration transmissibility | (1) | | X | | | | X | |
| 4.2 | Modal analyses | (1) | | X | | | | | |
| | | | | | | | | | |
| 5.0 | Modify SSM to flight configuration | (1) | | X | | | | | |
| 5.1 | Remove mass simulators | (1) | | X | | | | | |
| 5.2 | Inspect & replace flight Hardware as required | (1) | | X | | | | | |
| 5.3 | Install additional flight hrdwr as required | (1) | | X | | | | | |
| | | | | | | | | | |
| 6.0 | System I/F simulator-OPA & SI are electrically simulated | (1) | | X | | X | | | |
| | | | | | | | | | |
| 6.1 | System simulator readiness tests | (1) | | X | | X | | X | |
| 6.1.1 | Environmental tests | (1) | | X | | | | X | |
| 6.1.2 | Functional tests | (1) | | X | | | | | |
| | | | | | | | | | |
| 7.0 | Mate SSM & system simulator | (1) | | X | | X | | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

**Table C.6 (Cont) LST INTERFACE CHECKOUT MATRIX**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 8.0 | Perform initial SSM functional tests | (1) | User | X | X | X | X | | Either site |
| 8.1 | Electrical performance | (1) | | X | X | X | X | | |
| 8.2 | Mechanical performance | (1) | | X | X | X | X | | |
| 8.3 | Software checkout | (1) | | X | X | X | X | | |
| 8.4 | Test procedures checkout | (1) | | X | X | X | X | | |
| 8.5 | OTA/SI interfaces | (1) | | X | X | X | X | | |
| | | | | | | | | | |
| 9.0 | Perform SSM functional tests | (2) | | X | X | X | X | | |
| 9.1 | DMS functional test | (2) | | X | X | X | X | | |
| 9.2 | ICS functional test | (2) | | X | X | X | X | | |
| 9.3 | RCS functional test | (2) | | X | X | X | X | | |
| 9.4 | EPS functional test | (2) | | X | X | X | X | | |
| | | | | | | | | | |
| 10.0 | Receive OTA at user site | (1) | | X | | | | | |
| 10.1 | OTA receiving inspection | (1) | | X | | | | | |
| | | | | | | | | | |
| 11.0 | Receive 4 scientific instr. at user site | (1) | | X | | | | | |
| 11.1 | SI receiving inspection | (1) | | X | | | | | |
| | | | | | | | | | |

(1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

**Table C.4 (Cont) LST INTERFACE CHECKOUT MATRIX**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 12.0 | Remove OTA & SI simulators | (1) | User | X | X | | | | Either site |
| 13.0 | LST assembly operations | (1) | | X | X | | | | |
| 13.1 | Mate OTA, SI & SSM | (1) | | X | X | | | | |
| 13.2 | Verify electrical & mechanical interfaces | (1) | | X | X | | | | |
| 13.3 | Verify alignement | (1) | | X | X | | | | |
| 13.4 | Perform bus isolation tests | (1) | | X | X | | | | |
| 13.5 | Verify grounding | (1) | | X | X | | | | |
| | | | | | | | | | |
| 14.0 | LST functional interface test | (2) | | X | X | X | X | | Trade study |
| 14.1 | Verify command interface | (2) | | X | X | X | X | | |
| 14.2 | Verify telemetry interface | (2) | | X | X | X | X | | |
| 14.3 | Verify timing signal interface | (2) | | X | X | X | X | | |
| 14.4 | Verify grounding interface | (1) | | X | X | X | X | | |
| 14.5 | Verify electrical power interface | (2) | | X | X | X | X | | |
| | | | | | | | | | |
| 15.0 | LST mission simulation | (2) | | X | X | X | X | | |
| 15.1 | Launch conditioning | (2) | | X | X | X | X | | |
| 15.2 | Ascent | (2) | | X | X | X | X | | |
| 15.3 | Pre-deployment | (2) | | X | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

**Table C.4 (Cont) LST INTERFACE CHECKOUT MATRIX**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 15.4 | Post-deployment | (2) | User | X | X | X | X | | Trade study |
| 15.5 | Orbit operation | (2) | | X | X | X | X | | |
| 15.6 | Retrieval | (2) | | X | X | X | X | | |
| 15.7 | Reentry | (2) | | X | X | X | X | | |
| 15.8 | Recovery | (2) | | X | X | X | X | | |
| | | | | | | | | | |
| 16.0 | LST to data center interface compatibility | (2) | | X | X | X | X | | |
| 16.1 | EMC | (2) | | X | X | X | X | | |
| 16.2 | Software validation | (1) | | X | X | X | X | | |
| 16.3 | Capability to transmit & receive commands & data | (2) | | X | X | X | X | | |
| | | | | | | | | | |
| 17.0 | Acoustic test | (1) | | X | X | | | X | |
| 17.1 | Post-acoustic functional test | (2) | | X | X | X | X | | |
| 17.1.1 | DMS functional test | (2) | | X | X | X | X | | |
| 17.1.2 | ICS functional test | (2) | | X | X | X | X | | |
| 17.1.3 | FCS functional test | (2) | | X | X | X | X | | |
| 17.1.4 | EPS functional test | (2) | | X | X | X | X | | |
| 17.1.5 | OTA functional test | (2) | | X | X | X | X | | |
| 17.1.6 | SI functional test | (2) | | X | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

**Table C.4 (Cont)** LST INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 18.0 | Thermal vac/thermal balance test | (2) | User | X | X | | | X | Trade study |
| 18.1 | Simulate orbital operational conditions | (2) | | X | X | | | X | |
| 18.2 | Operate all functional modes | (2) | | X | X | X | X | X | |
| 18.3 | Post-test functional verification | (2) | | X | X | X | X | | |
| | | | | | | | | | |
| 19.0 | Configure LST for final operations & tests | (2) | | X | X | | | | Either site |
| 19.1 | Remove test instrumentation | (1) | | X | X | | | | |
| 19.2 | Configure for flight | (2) | | X | X | | | | |
| 19.3 | Reflectivity/emissivity measurements | (1) | | X | X | | | | |
| | | | | | | | | | |
| 20.0 | Weight and balance test | (1) | | X | X | | | X | |
| | | | | | | | | | |
| 21.0 | Prepare vertical or optional horizontal integration stand | (1) | | X | X | | X | X | Assuming IVE is adaptable to assy. |
| 22.0 | Install LST in integration stand | (2) | | X | X | | | | Either site |
| | | | | | | | | | |
| 23.0 | Perform LST/orbiter compatibility tests | (3) | | X | X | X | X | | Trade study |
| 23.1 | Verify mechanical interface | (3) | | X | X | X | X | | |
| 23.2 | Verify electrical interface | (3) | | X | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Table C.4 (Cont) LST INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | OPF SIM. | IVE | | |
| 23.3 | Launch readiness/conditioning sequences | (3) | User | X | X | X | X | | Trade study |
| 23.4 | Pre-deployment/post-deployment sequences | (3) | | X | X | X | X | | |
| 23.5 | Retrieval/recovery sequences | (3) | | X | X | X | X | | |
| | | | | | | | | | |
| 24.0 | Package & ship SSE to Launch site | (1) | | X | | | | | |
| 24.1 | Umbilical cables | (1) | | X | | | | | |
| 24.2 | LST MS panel | (1) | | X | | | | | |
| 24.3 | Payload purge system | (1) | | X | | | | | |
| 24.4 | TIP equipment | (1) | | X | | | | | |
| 24.5 | EVA support equipment | (1) | | X | | | | | |
| | | | | | | | | | |
| 25.0 | SSE arrival at Launch site | (1) | Launch site | | X | | | | |
| | | | | | | | | | |
| 26.0 | Transfer SSE to receiving facility | (1) | | | X | | | | |
| 26.1 | SSE receiving inspection | (1) | | | X | | | | |
| | | | | | | | | | |
| 27.0 | Transfer SSE to OPF | (1) | | | X | | | X | |
| 27.1 | Install SSE in orbiter (OPF) | (4) | | | X | | | X | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

**Table C.4 (Cont) LST INTERFACE CHECKOUT MATRIX**

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 28.0 | Closeout, package & ship to Launch site | (1) | User | X | | | | | |
| 28.1 | Install protective covers | (1) | ↓ | X | | | | | |
| 28.2 | Service with liquid helium | (1) | ↓ | X | | | | | |
| | | | | | | | | | |
| 29.0 | LST arrival at Launch site | (1) | launch site | | X | | | | |
| | | | ↓ | | | | | | |
| 30.0 | Transfer Lst to receiving facility | (1) | | | X | | | X | |
| | | | | | | | | | |
| 31.0 | Perform LST receiving inspection | (1) | | | X | | | X | |
| | | | | | | | | | |
| 32.0 | Install payload in canister | (1) | | | X | | | | |
| 32.1 | Erect payload canister to vertical position | (1) | | | X | | | | |
| | | | | | | | | | |
| 33.0 | Transfer Payload canister to FCR at pad | (1) | | | X | | | X | |
| | | | | | | | | | |
| 34.0 | Perform orbiter/payload interface verification and servicing | (1),(2) | | X | X | X | X | | Both sites; trade study |
| 34.1 | Charge flight batteries | (1) | | X | X | | | | ↓ |
| 34.2 | Service with liquid helium | (1) | | X | X | | | | |
| 34.3 | Orbiter/payload interface verification | (2) | ↓ | X | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Table C.4 (Cont) LST INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 35.0 | Install LST in orbiter bay | (4) | Launch site | | X | | | | |
| | | | | | | | | | |
| 36.0 | Orbiter/cargo interface verification | (4) | | | X | | | | |
| 36.1 | Electrical | (4) | | | X | | | | |
| 36.2 | Mechanical | (4) | | | X | | | | |
| 36.3 | Fluid | (4) | | | X | | | | |
| | | | | | | | | | |
| 37.0 | Verify LST launch readiness | (4) | | | X | | | | |
| | | | | | | | | | |
| 38.0 | Payload bay closeout | (4) | | | X | | | | |
| | | | | | | | | | |
| 39.0 | Launch operations | (4) | | | X | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

(1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

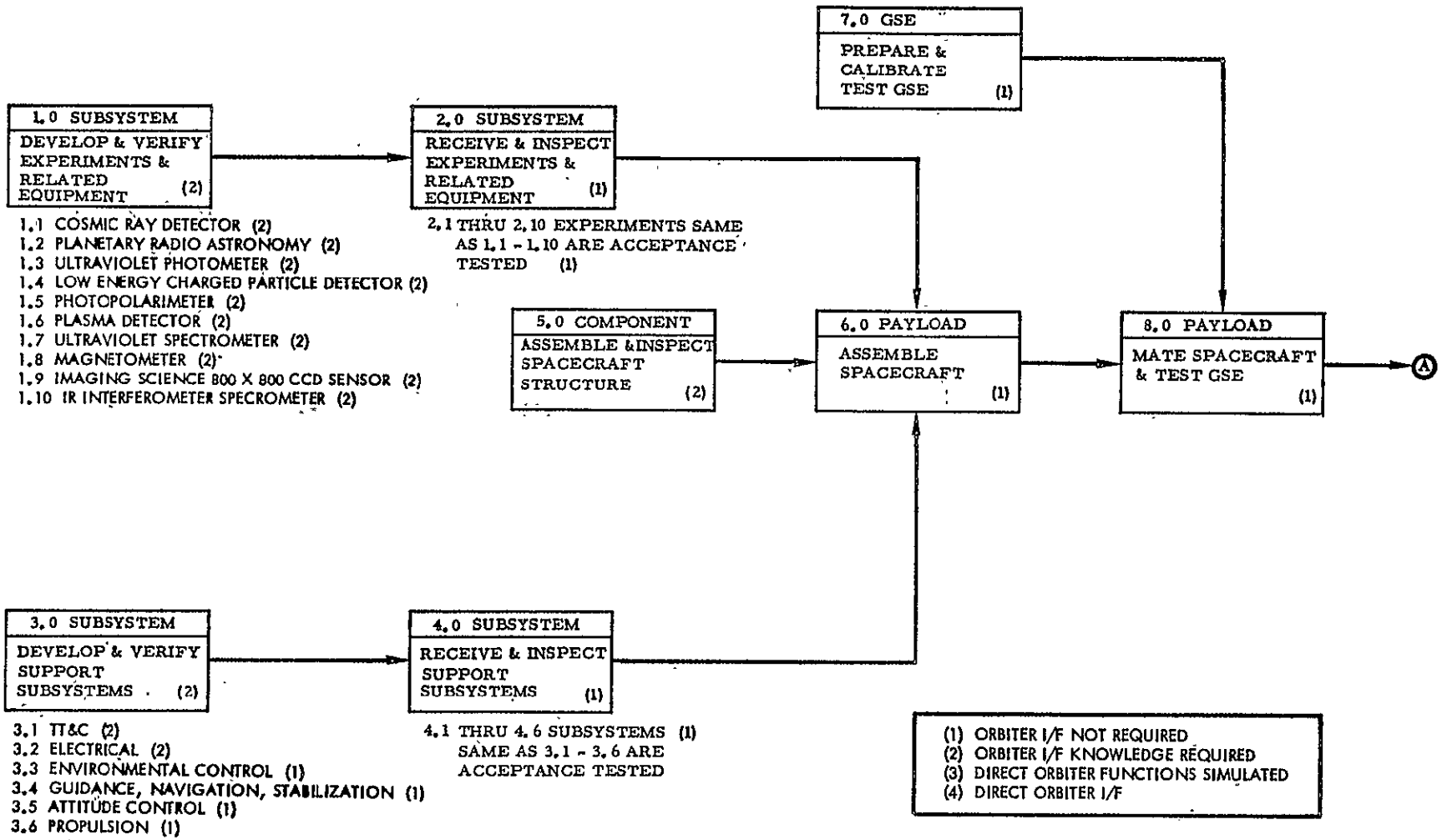



Figure C-5 Mariner Jupiter Orbiter/IUS


9.1 MECHANICAL ATTACHMENT OF EXPERIMENTS & SUBSYSTEMS (1)
9.2 LOCATION OF MOUNTING POINTS (2)
9.3 CLEARANCES (2)
9.4 UMBILICAL LOCATIONS (2)
9.4 ALIGNMENT (1)

10.1 GROUNDING (1)
10.2 BUS ISOLATION (1)
10.3 CONTINUITY (1)

11.1 LEAK CHECK FLUID FITTINGS (1)
11.2 LEAK CHECK FLUID SYSTEMS (1)

12.1 POWER DISTRIBUTION & ELECTRICAL LOAD (2)
12.2 CAUTION & WARNING OPERATION (2)
12.3 GUIDANCE, NAVIGATION, STABILIZATION (2)
12.4 ATTITUDE CONTROL (2)
12.5 TELEMETRY (2)
12.6 TRACKING (2)
12.7 COMMAND RFS (2)
12.8 TAPE RECORDER (2)
12.9 ANTENNA (2)
12.10 PYROSYSTEMS (1)
12.11 TYPICAL PAYLOAD EXPERIMENTS (10) (1)
12.21 EMC (1)

(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)

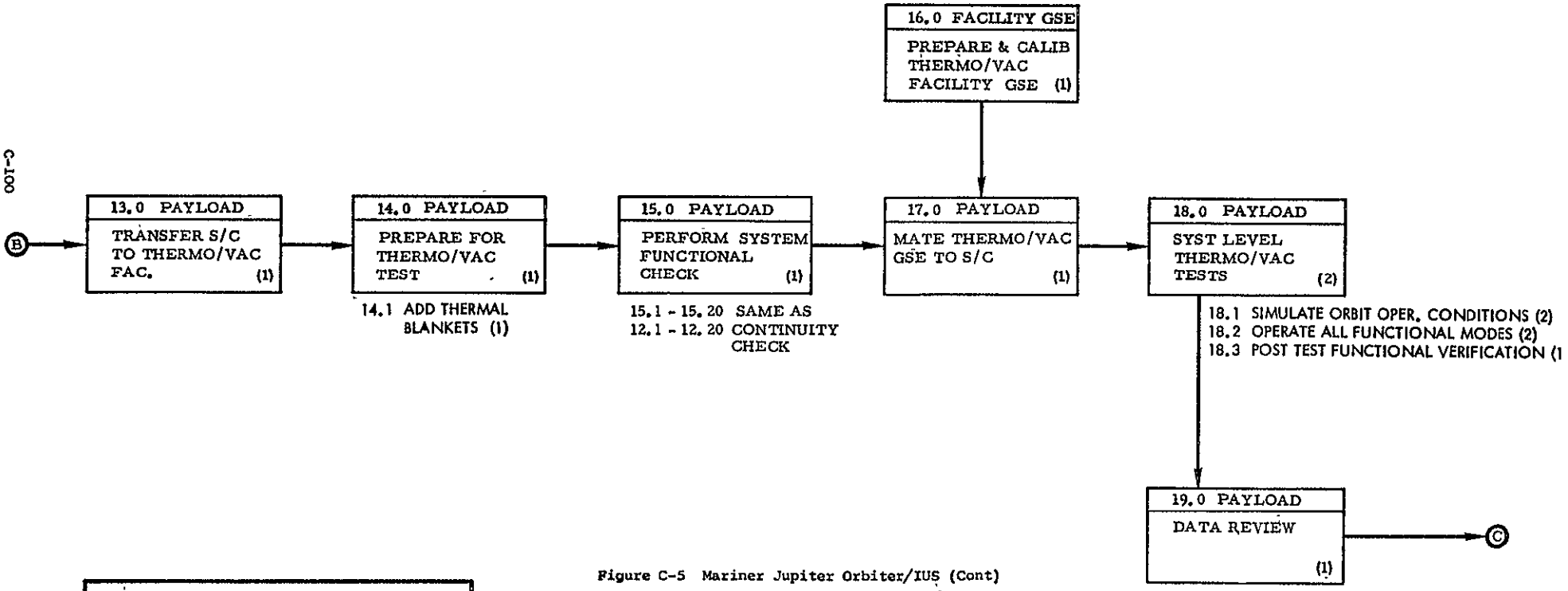
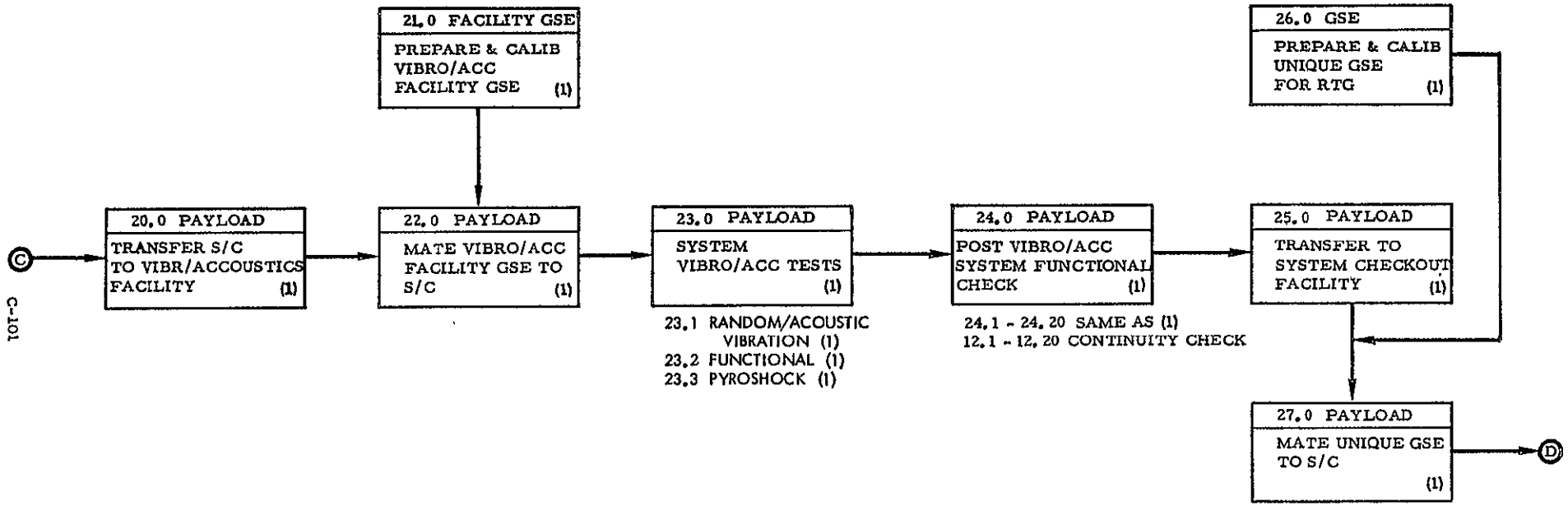



Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)

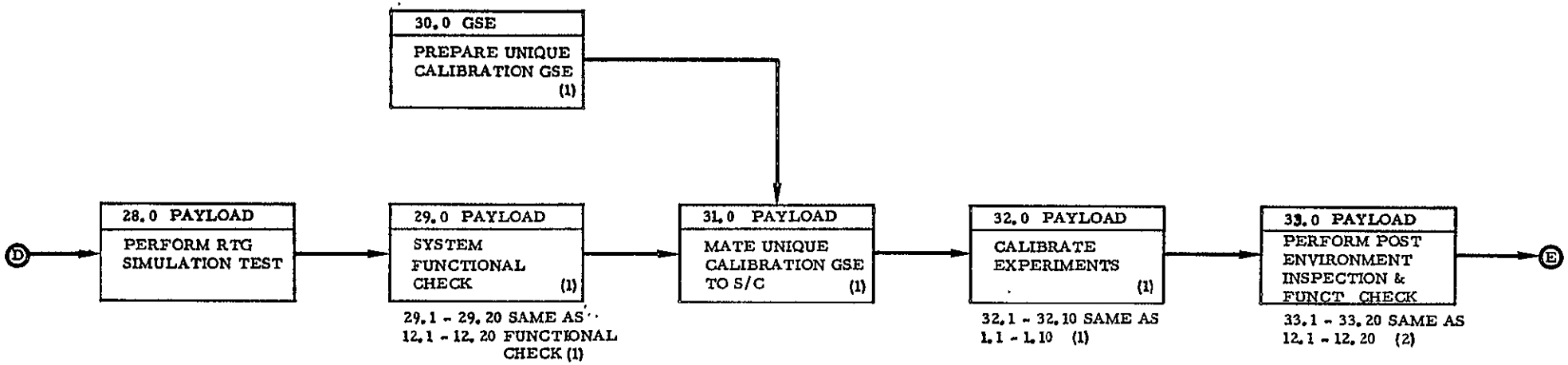
(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F




C-101

(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)




(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)

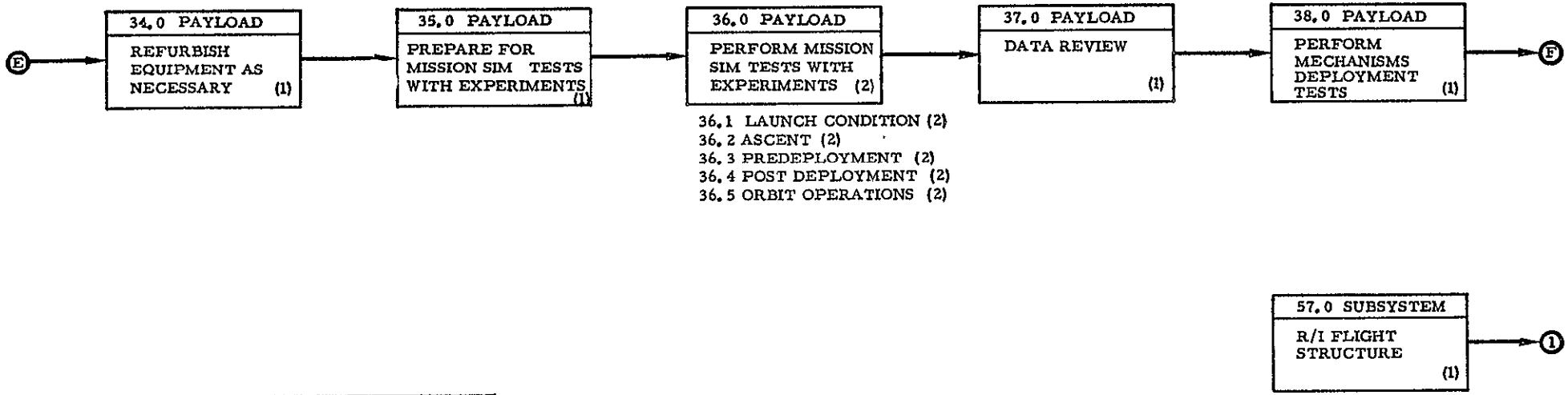



Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)

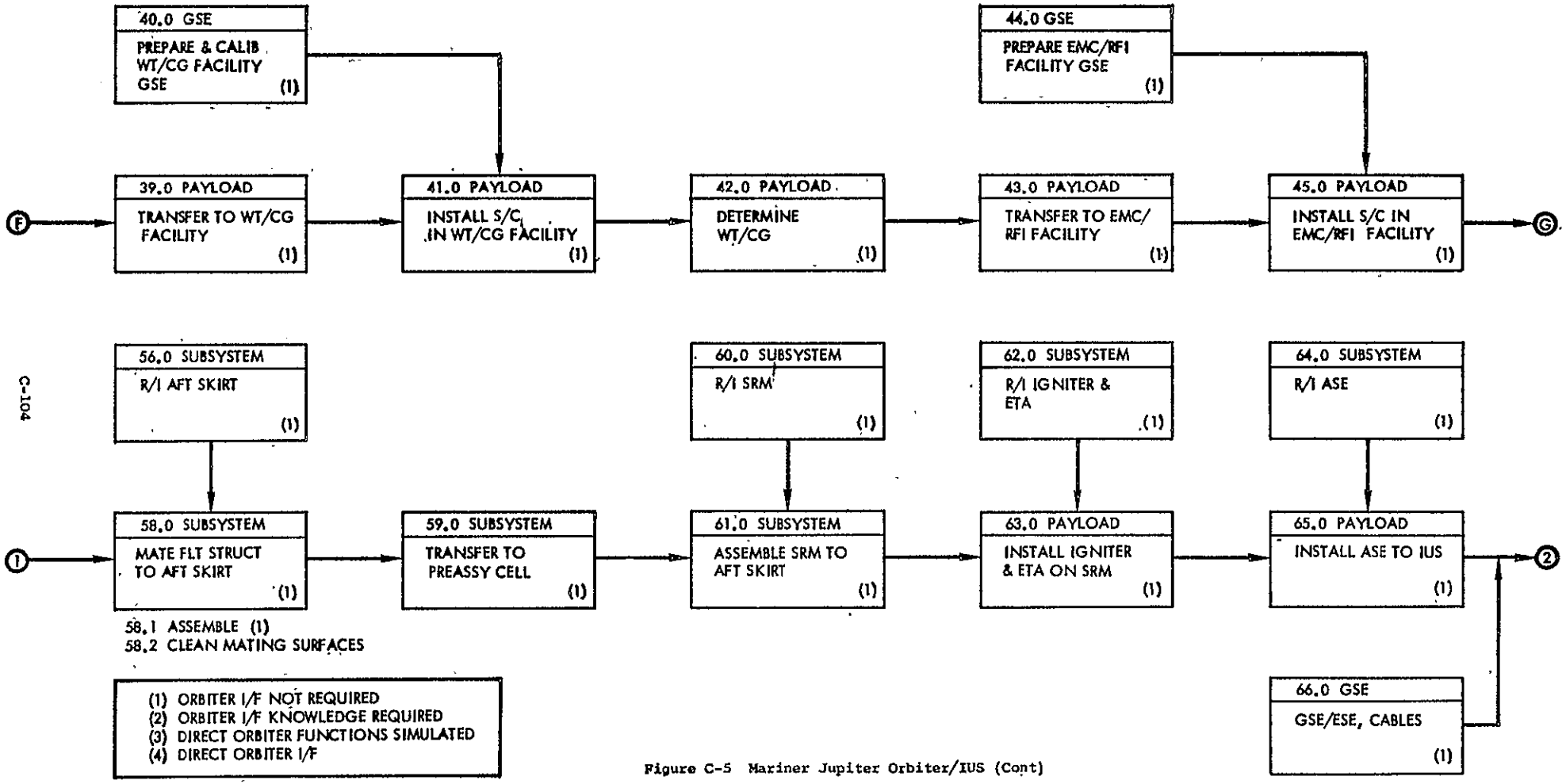



Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)

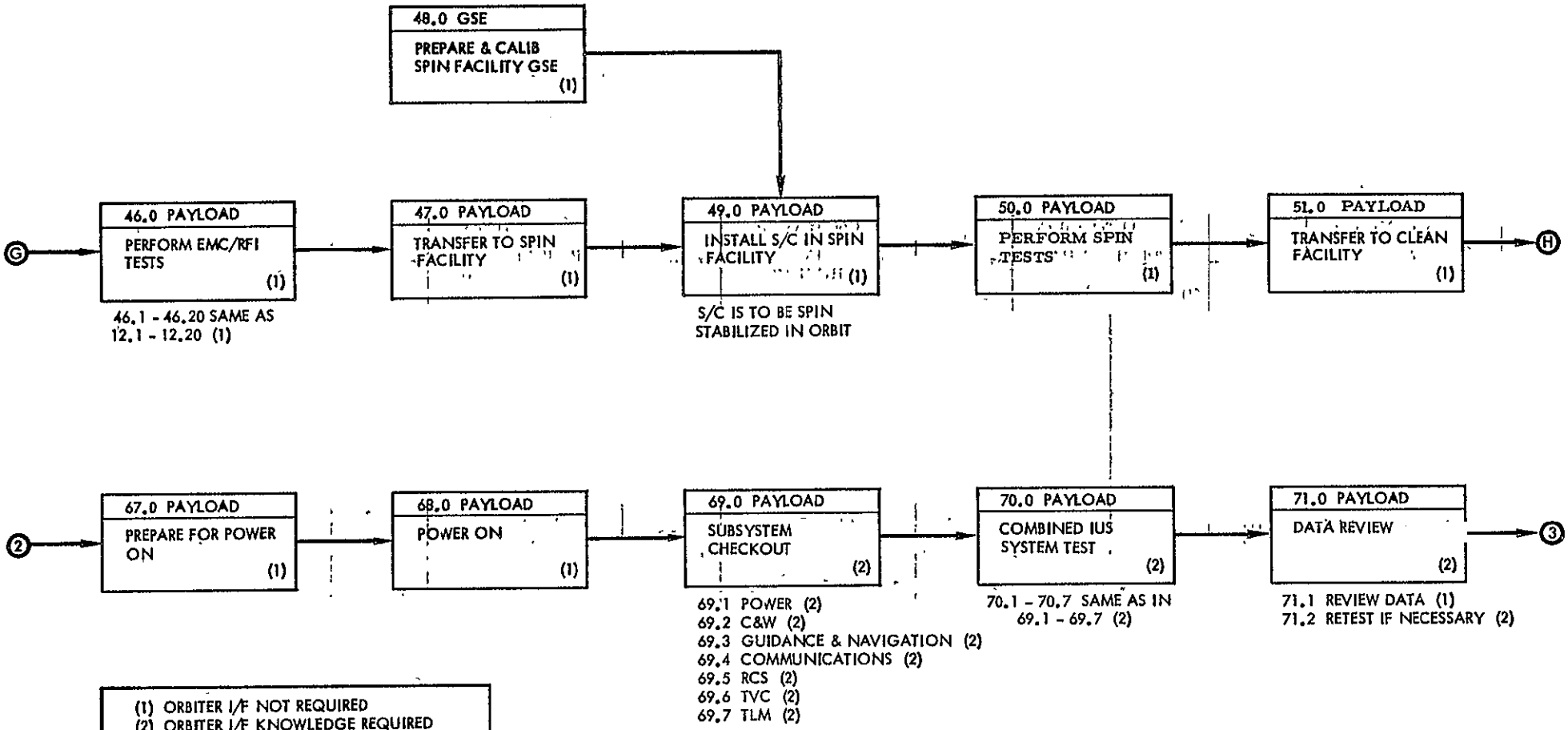



Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)

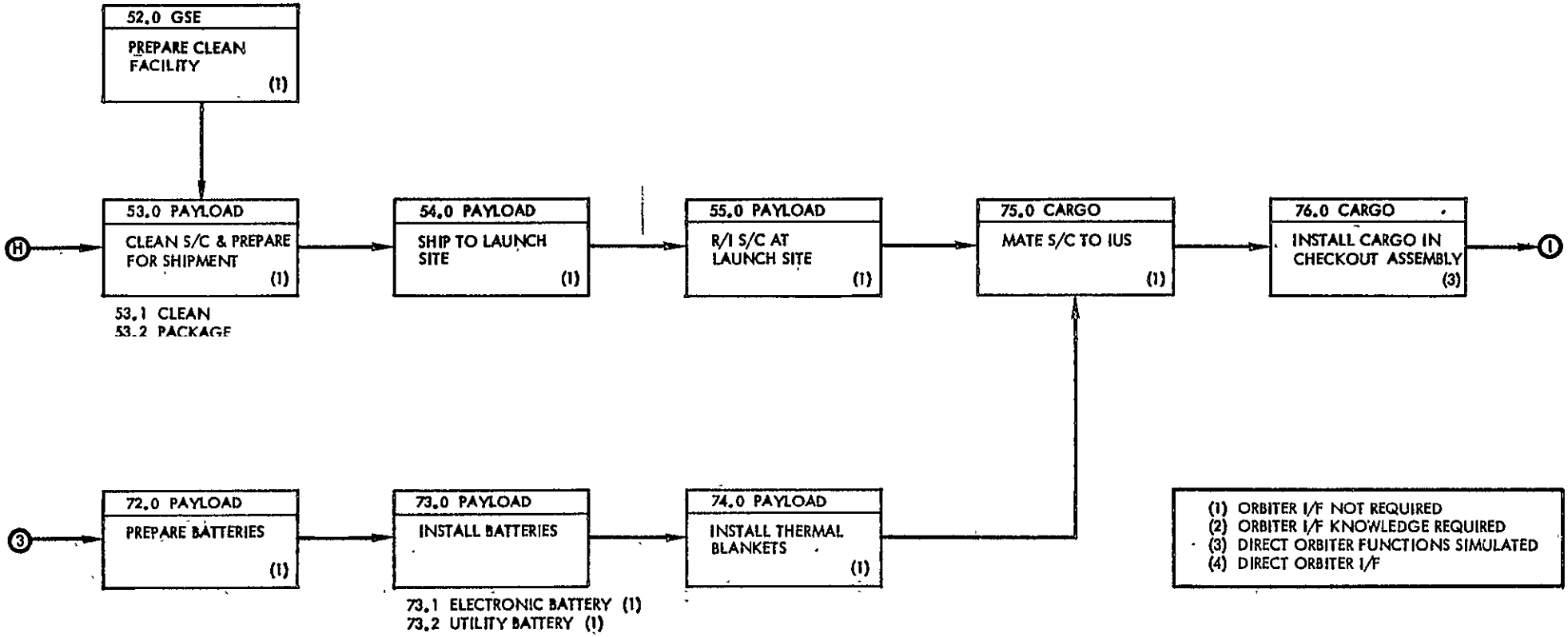
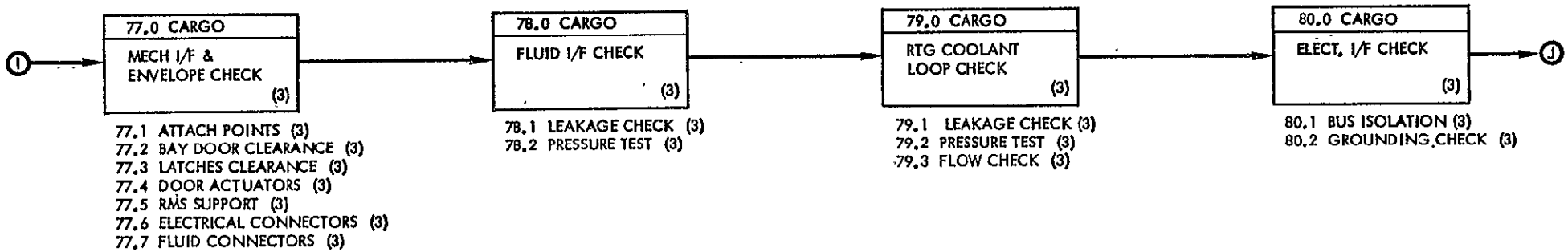
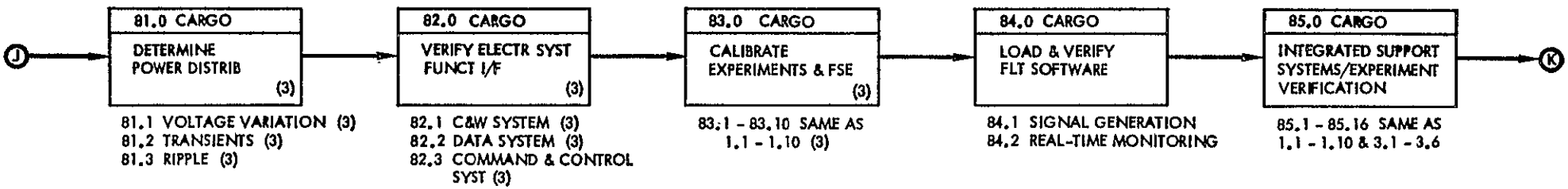



Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)




(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

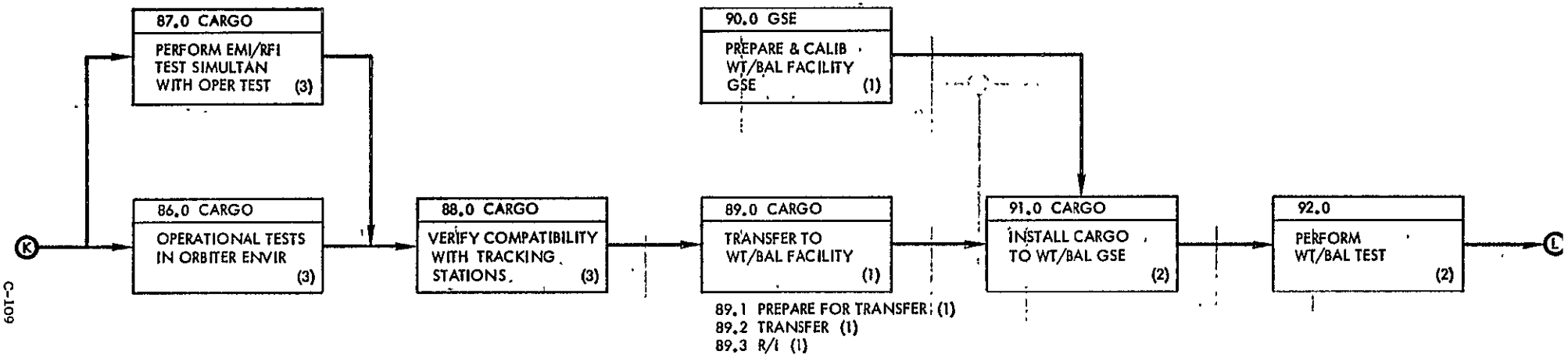
Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)






(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

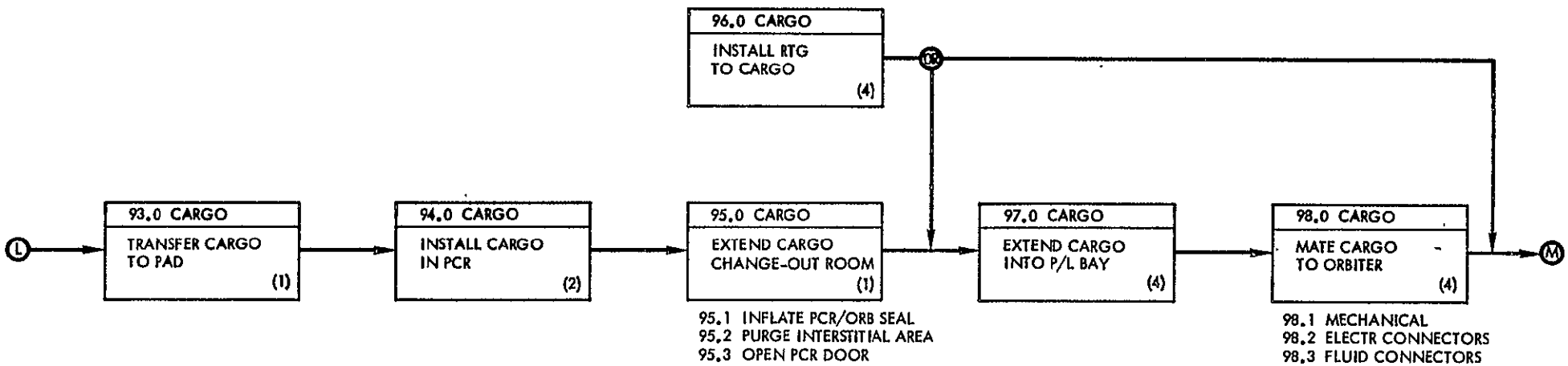
Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)




C-109

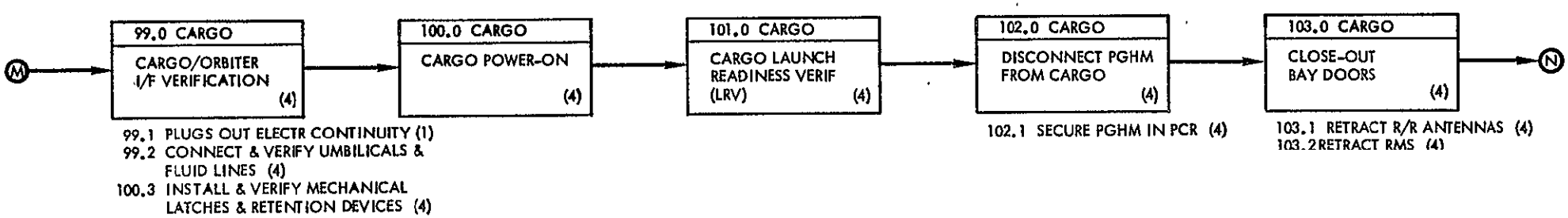
(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)



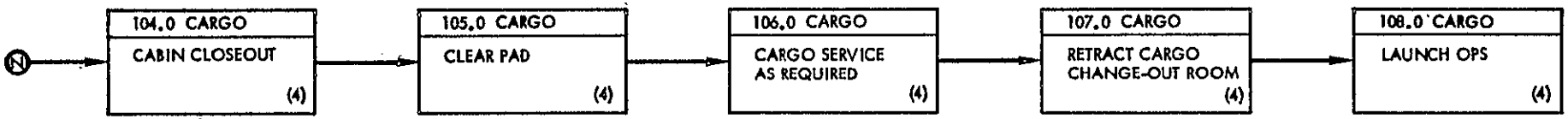

(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-5 Mariner Jupiter Orbiter/IUS (Con




(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)




(1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Figure C-5 Mariner Jupiter Orbiter/IUS (Cont)

Table C.5 MJO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHKCOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITF ORIENTED | GSE SIM. | IVE | | |
| 1.0 | Develop & verify experiments & related equipment | (2) | User | X | | | | | Various sources |
| 1.1 | Cosmic ray detector | (2) | | X | | | | | |
| 1.2 | Planetary radio astronomy | (2) | | X | | | | | |
| 1.3 | Ultraviolet photometer | (2) | | X | | | | | |
| 1.4 | Low energy charged particle detector | (2) | | X | | | | | |
| 1.5 | Photopolarimeter | (2) | | X | | | | | |
| 1.6 | Plasma detector | (2) | | X | | | | | |
| 1.7 | Ultraviolet spectrometer | (2) | | X | | | | | |
| 1.8 | Magnetometer | (2) | | X | | | | | |
| 1.9 | Imaging science 800x800 CCD sensor | (2) | | X | | | | | |
| 1.10 | IR interferometer spectrometer | (2) | | X | | | | | |
| 2.0 | Receive & inspect experiments & related equip. | (1) | | X | | | | | |
| 2.1 | 2.1 through 2.10 experiments same as 1.1 through 1.10 are acceptance tested | (1) | | X | | | | | |
| 3.0 | Develop & verify support subsystems | (2) | | X | | | | | |
| 3.1 | TT & C | (2) | | X | | | | | |
| 3.2 | Electrical | (2) | | X | | | | | |
| 3.3 | Environmental control | (1) | | X | | | | | |
| 3.4 | Guidance, navigation & stabilization | (1) | | X | | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

Table C.5 (Cont) MJO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 3.5 | Attitude control | (1) | User | X | | | | | Various sources |
| 3.6 | Propulsion | (1) | | X | | | | | |
| 4.0 | Receive & inspect support subsystems | (1) | | X | | | | | |
| 4.1 | 4.1 through 4.6 subsystems same as | | | | | | | | |
| | 3.1 through 3.6 are acceptance tested | (1) | | X | | | | | |
| 5.0 | Assemble & inspect spacecraft structure | (2) | | X | | | | | |
| 6.0 | Assemble spacecraft | (1) | | X | X | | | | Either site; trade study |
| 7.0 | Prepare & calibrate test GSE | (1) | | X | X | | | | |
| 8.0 | Mate spacecraft & test GSE | (1) | | X | X | | | | |
| 9.0 | Verify mechanical interfaces | (2) | | X | X | | | | |
| 9.1 | Mechanical attachment of experim. & subsystems | (1) | | X | X | | | | |
| 9.2 | Location of mounting points | (2) | | X | X | | | | |
| 9.3 | Clearances | (2) | | X | X | | | | |
| 9.4 | Umbilical locations | (2) | | X | X | | | | |
| 9.5 | Alignment | (1) | | X | X | | | | |
| 10.0 | Verify electrical interfaces | (1) | | X | X | | | | |
| 10.1 | Grounding | (1) | | X | X | | | | |
| 10.2 | Bus isolation | (1) | | X | X | | | | |
| 10.3 | Continuity | (1) | | X | X | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

Table C.5 (Cont) MLO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 11.0 | Verify fluid interfaces | (1) | User | X | X | | | | Either site; trade study |
| 11.1 | Leakcheck fluid fittings | (1) | | X | X | | | | |
| 11.2 | Leakcheck fluid systems | (1) | | X | X | | | | |
| 12.0 | Perform system level functional tests | (2) | | X | X | X | X | | |
| 12.1 | Power distribution & electrical load | (2) | | X | X | X | X | | |
| 12.2 | Caution & warning operation | (2) | | X | X | X | X | | |
| 12.3 | Guidance, navigation & stabilization | (2) | | X | X | X | X | | |
| 12.4 | Attitude control | (2) | | X | X | X | X | | |
| 12.5 | Telemetry | (2) | | X | X | X | X | | |
| 12.6 | Tracking | (2) | | X | X | X | X | | |
| 12.7 | Command RFS | (2) | | X | X | X | X | | |
| 12.8 | Tape recorder | (2) | | X | X | X | X | | |
| 12.9 | Antenna | (2) | | X | X | X | X | | |
| 12.10 | Pyrosystems | (1) | | X | X | X | X | | |
| 12.11 | Typical payload experiments (10 total) | (1) | | X | X | X | X | | |
| 12.21 | EMC | (1) | | X | X | X | X | | |
| 13.0 | Transfer spacecraft to thermo/vac facility | (1) | | X | X | | | X | |
| 14.0 | Prepare for thermo/vac tests | (1) | | X | X | | | X | |
| 14.1 | Add thermal blankets | (1) | | X | X | | | X | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTIONS SIMULATED
(4) DIRECT ORBITER I/F

Table C.5 (Cont) MJO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 15.0 | Perform system continuity check | (1) | User | X | X | | | | |
| 15.1 | 15.1 through 15.20 same as 12.1 through 12.20 functional check | (1) | | X | X | | | | |
| 16.0 | Prepare & calibrate thermo/vac facility GSE | (1) | | X | X | | | X | |
| 17.0 | Mate thermo/vac GSE to spacecraft | (1) | | X | X | | | X | |
| 18.0 | System level thermo/vac tests | (2) | | X | X | X | X | | |
| 18.1 | Simulate orbit operational conditions | (2) | | X | X | X | X | | |
| 18.2 | Operate all functional modes | (2) | | X | X | X | X | | |
| 18.3 | Post test functional verification | (1) | | X | X | X | X | | |
| 19.0 | Data review | (1) | | X | X | | | | Alternate site |
| 20.0 | Transfer S/C to vibr/accoustic facility | (1) | | X | X | | | X | |
| 21.0 | Prepare & calibrate vibro/acc. facility GSE | (1) | | X | X | | | X | |
| 22.0 | Mate vibro/acc facility GSE to spacecraft | (1) | | X | X | | | X | |
| 23.0 | System vibro/accoustic tests | (1) | | X | X | | | X | |
| 23.1 | Random/accoustic vibration tests | (1) | | X | X | | | X | |
| 23.2 | Functional check | (1) | | X | X | | | X | |
| 23.3 | Pyroshock | (1) | | X | X | | | X | |
| 24.0 | Post vibro/acc system continuity check | (1) | | X | X | | | X | |
| 24.1 | 24.1 through 24.20same as 12.1 through 12.20 functional check | (1) | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.5 (Cont) MIO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 25.0 | Transfer to system checkout facility | (1) | User | X | X | | | | |
| 26.0 | Prepare & calibrate unique GSE for RTG | (1) | | X | X | X | | | Unique GSE |
| 27.0 | Mate unique GSE to spacecraft | (1) | | X | X | X | | | |
| 28.0 | Perform RTG simulation test | (1) | | X | X | X | | | |
| 29.0 | Systems functional check | (1) | | X | X | X | X | | |
| 29.1 | 29.1 through 29.20 same as 12.1 through 12.20 functional check | (1) | | X | X | X | X | | |
| 30.0 | Prepare unique calibration GSE | (1) | | X | X | | | | Unique GSE |
| 31.0 | Mate unique calibration GSE to spacecraft | (1) | | X | X | | | | |
| 32.0 | Calibrate experiments | (1) | | X | X | | | | |
| 32.1 | 32.1 through 32.10 same as 1.1 through 1.10 | (1) | | X | X | | | | |
| 33.0 | Perform post environmental insp. & funct. check | (2) | | X | X | X | X | | |
| 33.1 | 33.1 through 33.20 same as 12.1 through 12.20 | (2) | | X | X | X | X | | |
| 34.0 | Refurbish equipment as necessary | (1) | | X | X | | | | |
| 35.0 | Prepare for mission sim. tests with experiments | (2) | | X | X | | | | |
| 36.0 | Perform mission sim. tests with experiments | (2) | | X | X | X | X | | Either site; trade study |
| 36.1 | Launch conditions | (2) | | X | X | X | X | | |
| 36.2 | Ascent | (2) | | X | X | X | X | | |
| 36.3 | Predeployment | (2) | | X | X | X | X | | |
| 36.4 | Post deployment | (2) | | X | X | X | X | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

Table C.5 (Cont) MJO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 36.5 | Orbit operations | (2) | User | X | X | X | X | | Either site; trade study |
| 37.0 | Data review | (1) | | X | X | | | | Alternate site |
| 38.0 | Perform mechanisms deployment tests | (1) | | X | X | X | | | |
| 39.0 | Transfer to WT/CG facility | (1) | | X | X | | | | |
| 40.0 | Prepare & calibrate WT/CG facility GSE | (1) | | X | X | | | X | |
| 41.0 | Install spacecraft in WT/CG facility | (1) | | X | X | | | X | |
| 42.0 | Determine WT/CG | (1) | | X | X | | | X | |
| 43.0 | Transfer to EMC/RFI facility | (1) | | X | X | | | | |
| 44.0 | Prepare EMC/RFI facility GSE | (1) | | X | X | | | | |
| 45.0 | Install spacecraft in EMC/RFI facility | (1) | | X | X | | | | |
| 46.0 | Perform EMC/RFI tests | (1) | | X | X | | | | |
| 46.1 | 46.1 through 46.20 same as 12.1 through 12.20 | (1) | | X | X | | | | |
| 47.0 | Transfer to spin facility | (1) | | X | X | | | | |
| 48.0 | Prepare & calibrate spin facility GSE | (1) | | X | X | | | X | |
| 49.0 | Install spacecraft in spin facility, (spacecraft to be spin stabilized in orbit) | (1) | | X | X | | | X | |
| 50.0 | Perform spin tests | (1) | | X | X | | | X | |
| 51.0 | Transfer to clean facility | (1) | | X | X | | | | |
| 52.0 | Prepare clean facility | (1) | | X | X | | | X | |
| 53.0 | Clean spacecraft & prepare for shipment | (1) | | X | X | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS STIMULATED

(4) DIRECT ORBITER I/F

Table C.5 (Cont) MJO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 53.1 | Clean | (1) | User | X | X | | | | |
| 53.2 | Package | (1) | ↓ | X | X | | | | |
| 54.0 | Ship to launch site | (1) | ↓ | X | X | | | | |
| 55.0 | R/I spacecraft at launch site | (1) | Launch site | | X | | | | |
| 56.0 | R/I aft skirt | (1) | ↓ | | X | | | | |
| 57.0 | R/I IUS flight structure | (1) | ↓ | | X | | | | |
| 58.0 | Mate flight structure to aft skirt | (1) | ↓ | | X | | | | Option: IUS could be shipped to user site ready to mate with S/C & transfered as a unit to LS |
| 58.1 | Assemble | (1) | ↓ | | X | | | | |
| 58.2 | Clean mating surfaces | (1) | ↓ | | X | | | | |
| 59.0 | Transfer to preassembly cell | (1) | ↓ | | X | | | | |
| 60.0 | R/I solid rocket motor (SRM) | (1) | ↓ | | X | | | | |
| 61.0 | Assemble SRM to aft skirt | (1) | ↓ | | X | | | | |
| 62.0 | R/I igniter & explosive train assembly (ETA) | (1) | ↓ | | X | | | | |
| 63.0 | Install igniter & ETA on SRM | (1) | ↓ | | X | | | | |
| 64.0 | Receive & inspect ASE | (1) | ↓ | | X | | | | |
| 65.0 | Install ASE to IUS | (1) | ↓ | | X | | | | |
| 66.0 | GSE/ ESE , cables | (1) | ↓ | | X | | | | |
| 67.0 | Prepare for power on | (1) | ↓ | | X | | | | |
| 68.0 | Power on | (1) | ↓ | | X | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

Table C.5 (Cont) MJO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 69.0 | Subsystem checkout | (2) | Launch site | | X | X | X | | Trade study |
| 69.1 | Power | (2) | | | X | X | X | | |
| 69.2 | Caution & warning | (2) | | | X | X | X | | |
| 69.3 | Guidance & navigation | (2) | | | X | X | X | | |
| 69.4 | Communications | (2) | | | X | X | X | | |
| 69.5 | Reaction control system (RCS) | (2) | | | X | X | X | | |
| 69.6 | Thrust vector control (TVC) | (2) | | | X | X | X | | |
| 69.7 | Telemetry (TLM) | (2) | | | X | X | X | | |
| 70.0 | Combined IUS system tests | (2) | | | X | X | X | | |
| 70.1 | 70.1 through 70.7 same as 69.1 through 69.7 | (2) | | | X | X | X | | |
| 71.0 | Data review | (2) | | | X | | | | |
| 71.1 | Review data | (1) | | | X | | | | |
| 71.2 | Retest if necessary | (2) | | | X | | | | |
| 72.0 | Prepare batteries for installation | (1) | | | X | | | | |
| 73.0 | Install batteries | (1) | | | X | | | | |
| 73.1 | Electronic battery | (1) | | | X | | | | |
| 73.2 | Utility battery | (1) | | | X | | | | |
| 74.0 | Install thermal blankets | (1) | | | X | | | | |
| 75.0 | Mate S/C to IUS | (1) | | | X | | X | | IVE may be used for mating |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

Table C.5 (Cont). MJO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 76.0 | Install cargo in checkout assembly | (3) | Launch site | | X | X | X | | Could be IVE or assembly structure |
| 77.0 | Mechanical interface and envelope check | (3) | | | X | | X | | |
| 77.1 | Attach points | (3) | | | X | | X | | |
| 77.2 | Bay door clearance | (3) | | | X | | X | | |
| 77.3 | Latches clearance | (3) | | | X | | X | | |
| 77.4 | Door actuators | (3) | | | X | | X | | |
| 77.5 | RMS support | (3) | | | X | | X | | |
| 77.6 | Electrical connectors | (3) | | | X | | X | | |
| 77.7 | Fluid connectors | (3) | | | X | | X | | |
| 78.0 | Fluid interface check | (3) | | | X | X | X | | |
| 78.1 | Leakage check | (3) | | | X | X | X | | |
| 78.2 | Pressure test | (3) | | | X | X | X | | |
| 79.0 | RTG coolant loop check | (3) | | | X | | X | | IVE cooling system will accommodate RTG |
| 79.1 | Leakage check | (3) | | | X | | X | | |
| 79.2 | Pressure test | (3) | | | X | | X | | |
| 79.3 | Flow check | (3) | | | X | | X | | |
| 80.0 | Electrical interface check | (3) | | | X | | | | |
| 80.1 | Bus isolation | (3) | | | X | | | | |
| 80.2 | Grounding check | (3) | | | X | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F

Table C.5 (Cont) MJO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 81.0 | Determine power distribution | (3) | Launch site | | X | X | X | | Either one; trade study |
| 81.1 | Voltage variation | (3) | | | X | X | X | | |
| 81.2 | Transients | (3) | | | X | X | X | | |
| 81.3 | Ripple | (3) | | | X | X | X | | |
| 82.0 | Verify electrical system functional interface | (3) | | | X | X | X | | |
| 82.1 | C&W system | (3) | | | X | X | X | | |
| 82.2 | Data system | (3) | | | X | X | X | | |
| 82.3 | Command & control system | (3) | | | X | X | X | | |
| 83.0 | Calibrate experiments & FSE | (3) | | | X | X | X | | Unique GSE |
| 83.1 | 83.1 through 83.10 same as 1.1 through 1.10 | (3) | | | X | X | X | | |
| 84.0 | Load & verify flight software | (3) | | | X | X | X | | Either one; trade study |
| 84.1 | Signal generation | (3) | | | X | X | X | | |
| 84.2 | Real time monitoring | (3) | | | X | X | X | | |
| 85.0 | Integrated support system/experiment verific. | (3) | | | X | X | X | | |
| 85.1 | 85.1 through 85.16 same as 1.1 through1.10 and 3.1 through 3.6 | (3) | | | X | X | X | | |
| 86.0 | Operational tests in orbiter environment | (3) | | | X | X | X | | |
| 87.0 | Perform EMI/RFI tests simultaneously with operational tests | (3) | | | X | X | X | | |
| 88.0 | Verify compatibility with tracking stations | (3) | | | X | X | X | | Unique equipment/facility |
| 89.0 | Transfer to WT/BAL facility | (1) | | | X | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTIONS SIMULATED

(4) DIRECT ORBITER I/F

**Table C.5 (Cont)** MJO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 89.1 | Prepare for transfer | (1) | Launch site | | X | | | | |
| 89.2 | Transfer | (1) | | | X | | | | |
| 89.3 | Receiving inspection | (1) | | | X | | | | |
| 90.0 | Prepare & calibrate WT/BAL facility GSE | (1) | | | X | | | | |
| 91.0 | Install cargo to WT/BAL GSE | (1) | | | X | | | | |
| 92.0 | Perform WT/BAL test | (2) | | | X | | | | |
| 93.0 | Transfer cargo to pad | (1) | | | X | | | | |
| 94.0 | Install cargo in PCR | (2) | | | X | | | X | Specilized handling equipment |
| 95.0 | Extend cargo changeout room | (4) | | | X | | | X | |
| 95.1 | Inflate PCR/orbiter seal | (4) | | | X | | | X | |
| 95.2 | Purge interstitial area | (4) | | | X | | | X | |
| 95.3 | Open PCR door | (1) | | | X | | | X | |
| 96.0 | Install RTG to cargo | (4) | | | X | | | | Specialized handling equipment |
| 97.0 | Extend cargo into payload bay | (4) | | | X | | | | |
| 98.0 | Mate cargo to orbiter | (4) | | | X | | | | |
| 98.1 | Mechanical | (4) | | | X | | | | |
| 98.2 | Electrical connectors | (4) | | | X | | | | |
| 98.3 | Fluid connectors | (4) | | | X | | | | |
| 99.0 | Cargo/orbiter interface verification | (4) | | | X | | | | |

* (1) ORBITER I/F NOT REQUIRED
(2) ORBITER I/F KNOWLEDGE REQUIRED
(3) DIRECT ORBITER FUNCTION SIMULATED
(4) DIRECT ORBITER I/F

Table C.5 (Cont) MJO/IUS INTERFACE CHECKOUT MATRIX

| BLOCK NO. | DESCRIPTION | INTERFACES | | | | CHECKOUT/TEST EQUIPMENT | | SPECIAL FACILITY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | * I/F KNOWLEDGE | BASELINE LOCATION | OPTION 1 USER ORIENTED | OPTION 2 LAUNCH SITE ORIENTED | GSE SIM. | IVE | | |
| 99.1 | Plugs out electrical continuity | (4) | Launch site | | X | | | | |
| 99.2 | Connect & verifyumbilicals and fluid lines | (4) | | | X | | | | |
| 99.3 | Install and verify mechanical latches and retention devices | (4) | | | X | | | | |
| 100.0 | Cargo power on | (4) | | | X | | | | |
| 101.0 | Cargo Launch Readiness Verification (LRV) | (4) | | | X | | | | |
| 102.0 | Disconnect payload ground handling mechanisms (PGHM) from cargo | (4) | | | X | | | | |
| 102.1 | Secure PGHM in PCR | (4) | | | X | | | | |
| 103.0 | Closeout bay doors | (4) | | | X | | | | |
| 103.1 | Retract Rendezvous radar (R/R) antennas | (4) | | | X | | | | |
| 103.2 | Retract RMS | (4) | | | X | | | | |
| 104.0 | Cabin closeout | (4) | | | X | | | | |
| 105.0 | Clear pad | (4) | | | X | | | | |
| 106.0 | Cargo services (as required) | (4) | | | X | | | | |
| 107.0 | Retract cargo changeout room | (4) | | | X | | | | |
| 108.0 | Launch operations | (4) | | | X | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

* (1) ORBITER I/F NOT REQUIRED

(2) ORBITER I/F KNOWLEDGE REQUIRED

(3) DIRECT ORBITER FUNCTION SIMULATED

(4) DIRECT ORBITER I/F